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Telehealth for patients with long term conditions

- Telehealth is a broad term used to describe the use of communication and information technologies that aim to provide healthcare at a distance.
- Vale of York Clinical Commissioning Group inherited a telehealth service that had failed to provide the expected benefits. They have requested an evidence briefing to inform their commissioning of telehealth services.
- The focus of this briefing is telehealth interventions for people with chronic obstructive pulmonary disease (COPD), diabetes or heart failure.
- Although there is a large amount of available evidence, much of it is weak and/or contradictory. However, there is good evidence that telehealth monitoring can reduce mortality in patients with heart failure, particularly those recently discharged from hospital.
- Studies evaluating the cost-effectiveness of telehealth generally have methodological weaknesses that limit their reliability and generalisability to NHS settings.
- Many of the conditions that have favoured the successful large-scale implementation of telehealth in other settings (remote populations, centralised IT infrastructure and decision-making) are not replicated in the NHS.
- Implementing telehealth systems more incrementally at a pace that enables greater system integration and local adaptation may offer a better chance of success than a 'big bang' approach. Monitoring resource use, patient experience and impact on clinical outcomes will be integral to any service deployment.

This evidence briefing has been produced for the Vale of York CCG by the Centre for Reviews and Dissemination (CRD). Full details of methods are available on request (paul.wilson@york.ac.uk or duncan.chambers@york.ac.uk).

CRD is part of the National Institute for Health Research (NIHR) and is a department of the University of York. The Centre aims to provide decision makers with research-based information about the effects of interventions used in health and social care.

Background

Telehealth involves the use of any of a range of communication and information technologies that aim to provide health care at a distance. It is the focus of a great deal of interest because of its potential benefits both to patients with long-term health conditions (supporting self-management and reducing unnecessary healthcare appointments) and to healthcare systems (by enabling more efficient use of resources).[1] In England the large-scale implementation of telehealth systems is strongly supported by the Department of Health.[2]

North Yorkshire and York Primary Care Trust (PCT) commissioned a telehealth service using units purchased from Tunstall but deployment of the units was slower than expected, resulting in significant financial losses.[3] Vale of York Clinical Commissioning Group (CCG), as one of the successors of the former PCT, have requested an evidence briefing to inform their decision-making on the future commissioning of telehealth services.

Methods

This briefing is a rapid appraisal and summary based mainly on existing sources of synthesised and quality-assessed evidence, primarily systematic reviews and economic evaluations. It is not a systematic review and we have not carried out exhaustive literature searches. The scope of the briefing is as follows:

- Population: Patients with long-term conditions, specifically chronic obstructive pulmonary disease (COPD), diabetes or heart failure.
- Intervention: Telehealth, defined as remote monitoring or physiological measurement at a distance using electronic means of communication and relay of data to a central location for review and response by a clinician.
- Comparator: Usual care.
- Outcomes: Use of healthcare resources, quality of life, any impact on clinical outcomes, any measure of cost-effectiveness.

Systematic reviews and economic evaluations have been identified by searching the following sources:

- DARE (quality-assessed systematic reviews of interventions)
- Cochrane Database of Systematic Reviews
- NHS EED
- CRD HTA database.

For the sections on implementation and health equity, we have followed the methods in our published framework,[4] but these sections are not based on systematic literature searches.

Evidence base for effectiveness

This section draws on two overviews of systematic reviews[5, 6] and on systematic reviews of telehealth in specific conditions as discussed below.

COPD

Three systematic reviews[7-9] and one recent HTA report (from Canada)[10] were identified. The Cochrane review by McLean et al. used a broad definition of telehealthcare as 'the provision of personalised health care from a distance' and included studies of telephone support, videoconferencing, Internet based management and telemonitoring. The other reviews and HTA report concentrated more specifically on telemonitoring and/or telephone support.

Our interpretation is that the intervention of most relevance to Vale of York CCG is home telemonitoring, which was defined similarly in the reviews by Bolton et al.[7] and Polisena et al.[9] and in the Canadian HTA report.[10] These reviews all included evidence from both randomised and non-randomised studies.

The most recent review, the Canadian HTA report, included three RCTs of home telemonitoring with a total of 181 participants. One of the RCTs was done in the UK; the others were performed in Italy (this trial was actually a subgroup analysis of a larger trial) and the USA. All the RCTs involved patients with moderate to severe COPD but there were differences between the populations: one trial recruited patients requiring home ventilation or long-term oxygen therapy, another involved participants in a pulmonary rehabilitation programme and the third recruited outpatients from a single hospital. Details of the telemonitoring interventions and the usual care provided to the control group also varied considerably between trials.

The three RCTs evaluated various different outcomes. Hospitalisations were evaluated in all three trials. One found a significant difference favouring telemonitoring in hospitalisations per patient-month of follow-up. The other trials (including one with hospitalisation as the primary outcome) found no significant difference between telemonitoring and usual care groups. Two of the trials evaluated quality of life as measured by the St George's Respiratory Questionnaire (SGRQ); one found a significant difference favouring telemonitoring, the other found no significant difference between groups. Only one RCT looked at mortality and this found no significant difference between groups. Overall, the trials either found no significant difference between telemonitoring and usual care or there were conflicting results between trials.

The Canadian HTA report evaluated the quality of evidence (including the non-randomised studies as well as the randomised trials) for each outcome using the GRADE system. This takes into account consistency between trials, precision of effect estimates and likely generalisability of the results as well as methodological quality.[11] Quality of evidence for most outcomes was rated as 'low', which means that confidence in any effect estimate derived from this evidence is limited and the true estimate could be substantially different from the estimate.

The authors noted that 'home telemonitoring is largely dependent on local information technologies, infrastructure and personnel', which means that generalisability of trial findings to other settings may be low. They suggested that home telemonitoring interventions should be tested in the local setting before adoption; an alternative approach would be to focus on home-grown interventions which again should be evaluated before widespread adoption.[10]

Diabetes

The overviews of systematic reviews by Ekeland et al.[5] and by Wootton[6] included ten different systematic reviews on telehealth interventions for diabetes. Wootton reported that five out of six included reviews assessed effects on glycated haemoglobin (HbA_{1c}); of these, one found a significant difference favouring the telehealth group while the others reported no significant difference between intervention and control groups. The only review to provide quantitative data on hypoglycaemia and ketoacidosis found no significant difference for these outcomes.

Turning to the individual systematic reviews, several could be excluded because they used a broader definition of telehealth[12] or focused on teleconsultation or videoconferencing rather than telemonitoring.[13, 14] Of the remaining reviews, the most up-to-date and relevant covered home telehealth and included studies of home telemonitoring and telephone

support.[15] Another review[16] focused on interventions for young people with type 1 diabetes and will also be discussed briefly.

The review by Polisena et al. included 21 studies of telemonitoring (12 RCTs) and five studies of telephone support. Follow-up ranged from three months to three years. Despite the relatively large number of studies of telemonitoring, meta-analysis of randomised trials was only possible for glycaemic control at follow-up (measured as HbA_{1c}). The analysis showed a small but statistically significant difference favouring telemonitoring (weighted mean difference 0.22, 95% CI: 0.08 to 0.35; 12 randomised trials). The results of the meta-analysis were heavily influenced by a trial of a telemedicine case management intervention in New York City and New York State, which contributed over 60% of total participants. The intervention and population in this trial (Medicare recipients aged over 55 years living in medically underserved areas) may be sufficiently different from those in York to make the generalisability of the results questionable.

Other outcomes in the review were based on smaller numbers of studies. Telemonitoring was associated with a reduction in the number of hospitalised patients (two studies); a reduction in hospitalisations (one study) and a reduction in bed days of care (three studies).

Home telemonitoring was also associated with: mixed effects on the number of patients visiting emergency departments (one positive and one negative study); an increase in the number of patients who visited primary care (two studies), but a reduction in the number of primary care visits (one study); an increase in the number of patients who visited specialist clinics (one study); and an increase in the number of office visits (one study).

The review concluded that home telehealth had a positive effect on glycaemic control and healthcare resource use, but further research is needed. The review was generally well conducted, but limited evidence and mixed outcomes for resource use should be taken into account when interpreting the findings.

The review by Shulman et al. evaluated telemedicine interventions for transmission of blood glucose data with clinician feedback for young people (younger than 19 years) with type 1 diabetes.[16] This review covered a wide range of interventions including videoconferencing and text messaging as well as telemonitoring and telephone support. Ten studies were included, all of which appeared to be randomised or quasi-randomised trials. The review found no statistically significant difference between intervention and control groups for HbA_{1c} or incidence of severe hypoglycaemia or diabetic ketoacidosis. Quality of evidence was rated as low for all these outcomes using GRADE.

In summary, the evidence base for telehealth in diabetes is more extensive than that for COPD. However, examination of the most recent generally well-conducted review suggests that the quality of the evidence is generally low and the relevance to the local setting and context is uncertain.

Heart failure

The overviews of systematic reviews by Ekeland et al.[5] and by Wootton[6] included ten different systematic reviews on telehealth interventions for heart failure. Of these, nine deal with telemonitoring with or without telephone support. A search for more recent publications identified yet another general review of telemonitoring,[17] a review of studies reporting on patient satisfaction[18] and a HTA report from the University of Pennsylvania.[19]

Wootton noted that the nine heart failure systematic reviews included in his overview produced eight pooled estimates of effect, all except one of which were significantly in

favour of telemedicine over control (usual care). These reviews included the Cochrane review by Inglis et al. (see below). However, Wootton also noted that a number of trials with less positive results had been published recently and were not included in the Cochrane review.

The Cochrane review of structured telephone support or telemonitoring[20] attempted to evaluate these interventions while controlling for other disease management interventions (such as home visits or educational interventions) which may confound the benefits of telephone support or telemonitoring. For this reason, trials were only included if neither the intervention nor the usual care group received a home visit or more than the usual (4 to 6 weeks) clinic follow-up. This has the implication that the review may overestimate the benefits of telemonitoring compared with more complex versions of usual care as implemented in NHS practice (for example, assignment to a heart failure specialist nurse).

The review included 11 published randomised trials (2,710 participants) comparing telemonitoring with usual care. Telemonitoring significantly reduced all-cause mortality at the end of follow-up by 34% (relative risk 0.66, 95% CI: 0.54 to 0.81). In absolute terms, this equates to a reduction from 154/1000 to 102/1000 (95% CI: 83 to 125) for patients of the type included in the trials (mostly people with symptomatic heart failure). Telemonitoring also reduced all-cause hospitalisation by 9% (relative risk 0.91, 95% CI: 0.84 to 0.99; 8 trials, 2343 participants). The authors translated this to an absolute reduction from 521/1000 to 474/1000 (95% CI: 438 to 516). Using GRADE, the quality of evidence was rated 'moderate' for mortality and 'low' for hospitalisation.

Benefits of telemonitoring were also reported for a range of other outcomes including quality of life, healthcare costs and functional class (New York Heart Association). Very little information was reported on length of hospital stay: one study of structured telephone support (not telemonitoring) reported a significantly shorter length of stay for patients in the intervention group and one telemonitoring study (published as an abstract only) reported a 'substantial' difference in number of hospital days per patient.

An updated estimate of the effect of telemonitoring on mortality and hospitalisation was included in the University of Pennsylvania HTA report.[19] The authors stated that they used the same inclusion criteria as the Cochrane review. Eighteen trials with 5,738 participants were included. The effect on all-cause mortality remained significant though less than that seen in the Cochrane review (relative risk 0.79, 95% CI: 0.69 to 0.91). In contrast the effect on all-cause hospitalisation was no longer significant (relative risk 0.95, 95% CI: 0.85 to 1.05, 15 trials 4,661 participants).

The authors also performed a meta-analysis of trials of telemonitoring specifically for patients with heart failure recently (within the last 2 weeks) discharged from hospital. Telemonitoring was associated with a 39% relative reduction in mortality in this population (relative risk 0.61, 95% CI: 0.43 to 0.85; 7 trials, 1,327 participants). The authors estimated that for every thousand patients discharged on telemonitoring, 47 deaths would be prevented (95% CI: 18 to 69), although the time period of this analysis was not specified.

Length of hospital stay was not assessed in the HTA report. Thirty-day readmission rates in recently hospitalised patients were reported in a single RCT. There were fewer readmissions in the telemonitoring group but the small number of events meant that the difference was not significant. Telephone support did significantly reduce readmissions of recently hospitalised patients compared with usual care (odds ratio 0.62, 95% CI: 0.40 to 0.98; 4 trials, 778 participants).

Using GRADE, the quality of the evidence was classified as 'high' for mortality and 'moderate' for hospitalisation for both the overall and recently discharged populations. 'High' quality evidence means that we are very confident that the true effect is close to the estimate of effect derived from the evidence and further research is very unlikely to change this. 'Moderate' quality evidence means that the true effect is likely to be close to the estimated effect but there is a possibility that it is substantially different.

A further systematic review and meta-analysis examined remote monitoring for patients with heart failure recently (≤28 days) discharged from hospital.[21] This review examined both telemonitoring and structured telephone support and used a different analytical approach than the US HTA report. Nine trials of telemonitoring and one that assessed both telemonitoring and telephone support were included. The review also distinguished between telemonitoring with medical support provided during office hours only (nine trials) and 24/7 telemonitoring (one trial). In this meta-analysis the benefit of telemonitoring (office hours or 24/7) over usual care for all-cause mortality did not reach statistical significance. When one UK trial that provided particularly good support to the control group (specialist heart failure service) was excluded, both types of telemonitoring significantly reduced mortality compared with usual care. The authors concluded that the impact of remote monitoring is likely to be greater when 'usual care' is less good. This could be an important issue to consider in making decisions about local service provision.

Table 1: Summary of key outcomes in systematic reviews of telemonitoring for patients with heart failure

Evidence source	Outcome	Main findings (telemonitoring vs. usual care)	Quality of evidence (GRADE)
Cochrane review[20]	All-cause mortality	34% relative reduction Absolute reduction from 154/1000 to 102/1000	Moderate
	All-cause hospitalisation	9% relative reduction Absolute reduction from 521/1000 to 424/1000	Low
US HTA report[19]	All-cause mortality	21% relative reduction	High
	All-cause mortality (recently discharged patients)	39% relative reduction	High
	All-cause hospitalisation	Non-significant 5% relative reduction	Moderate
Pandor et al. (May 2013)[21]	All-cause mortality (recently discharged patients)	Non-significant relative reductions of 24% (office hours) and 51% (24/7)	Moderate

The review of patient satisfaction studies by Kraal et al. concluded that in general patients with heart failure seemed to be satisfied or very satisfied with the use of telemonitoring.[18] However, the quality of studies assessing this outcome was considered to be poor.

Overall there is good evidence from research supporting the *efficacy* of telemonitoring over basic usual care in reducing mortality, and possibly hospitalisation, in patients with heart failure. However, the available evidence has considerable limitations in addressing the *effectiveness* of telemonitoring in clinical practice in the local setting. Only one of the trials in the Cochrane review was conducted in the UK. Details of the technologies used, data collected and frequency of collection varied considerably between trials. Trials also differed in the type of patient recruited. While patients recently hospitalised for heart failure

could be identified as a group for whom telemonitoring might be particularly beneficial, patients with relatively stable heart failure appear to be under-represented in the trials. The Cochrane review recommended further research to establish the role of telemonitoring or telephone support alongside other components of disease management programmes for heart failure. Finally, although this evidence briefing has concentrated on telemonitoring interventions, structured telephone support has a relatively strong evidence base and could be considered as a possible alternative strategy for some patients.

Update of the Whole System Demonstrator (WSD) trial

Although this evidence briefing is based mainly on synthesised evidence rather than single studies, we have included a brief update on the WSD trial in view of its importance to the current discussion around telehealth in the NHS. The WSD trial is a cluster-randomised trial (using general practices as the unit of randomisation) of telehealth (essentially telemonitoring) and telecare in addition to usual care versus usual care alone in patients with long-term conditions (COPD, diabetes or heart failure) or social care needs.[22] The trial was funded by the Department of Health to obtain evidence relevant to the implementation of telehealth in the NHS. First results from the trial were published in 2012.[1]

The first paper reported that telehealth was associated with a significant reduction in the odds of hospital admission at 12 months' follow-up (odds ratio 0.82, 95% CI: 0.70 to 0.97). Mortality at 12 months was also significantly lower, with a 46% relative reduction for the telehealth group compared with usual care (4.6% vs. 8.3%; odds ratio 0.54, 95% CI: 0.39 to 0.75).

Interpretation of these results is complicated by a number of factors. The group difference in admission proportion was relatively small (10.8%, 95% CI: 3.7% to 18.1%), which, as the authors acknowledged, raised 'questions about the clinical relevance of the results'.[1] Commentators suggested that the impact on mortality, not one of the main outcomes of the trial, needed to be explained and shown to be replicable in view of mixed evidence from other studies.[23] Finally, the difference in emergency admissions was at least partly driven by an increase in emergency department visits and admissions among the control group early in the trial. A possible explanation for this could be that clinicians may have identified issues needing urgent attention during the process of assessing and recruiting patients but if so it is unclear why this should have disproportionately affected the control group.[1]

Further results from the trial were published in February and March 2013. One paper looked at the effect of telecare and found that telecare did not lead to significant reductions in health and social care service use over 12 months.[24] This analysis involved telecare rather than telemonitoring and looked at people with social care needs so it is of limited relevance to this briefing. Another paper reported on the effects of telehealth on quality of life and psychological outcomes over 12 months in people with COPD, diabetes or heart failure.[25] The authors found no significant differences between the telehealth and usual care groups for any outcome and concluded that telehealth as implemented in the WSD trial did not improve quality of life or psychological outcomes.

Two other papers based on the WSD trial will be considered in the implementation section of this briefing.[26, 27]

WSD economic evaluation

The WSD trial also included an economic evaluation and the results of this were finally published on March 22 2013.[28] Costs and outcomes were measured for 538 patients receiving telehealth and 431 receiving usual care. The primary outcome was incremental cost per quality adjusted life year (QALY) gained. The adjusted mean difference in QALY

gain between groups at 12 months was 0.012. Total health and social care costs were higher in the telehealth group, resulting in an incremental cost per QALY of £92,000. In this analysis the probability of telehealth being cost-effective at the maximum threshold recommended by NICE (i.e., £30,000 per QALY) was just 11%. If costs of project management were excluded, the cost per QALY gained remained high at £79,000 and the probability of being cost-effective only increased to 17%. The authors' main conclusion was that telehealth as implemented in the trial does not seem to be a cost-effective addition to usual care.

The economic evaluation also included a number of sensitivity analyses looking at the effect of reduced costs for telehealth equipment and of having telehealth services operating at full capacity (which was not the case in the trial). Assuming an 80% reduction in equipment costs and a system operating at full capacity, the incremental cost per QALY gained fell to £12,000 and the probability that adding telehealth to usual care would be cost-effective increased to 61%.

The question of whether telehealth can be used more effectively by targeting particular patient groups was not addressed in the paper but the authors implied that it may be covered in future analyses of data from the WSD trial.[28]

This economic evaluation provides evidence relevant to decision-making about telehealth in the NHS. However, there are a number of limitations and uncertainties. The study mainly relied on self-reported measures of health service use, which may have resulted in under-reporting. Costs and outcomes were measured after 12 months, which may be too short to fully reflect the benefits of telehealth.[28] The telehealth used in the trial reflected availability at the time the trial started and by definition is now out-of-date. The authors allowed for reductions in equipment costs in their sensitivity analyses but such analyses are inherently uncertain. The economic evaluation, like the whole WSD trial, assessed the effect of adding telehealth to usual care when arguably the real question is the extent to which telehealth can be substituted for current models of usual care.

Finally the authors raised the question of the balance of investment and benefits between different parts of the health and social care system. If telehealth is mainly paid for by primary and social care while savings occur mainly in the acute sector, it will be important to reflect this by investing savings back to primary and social care.[28]

Cost-effectiveness

In addition to the WSD economic evaluation, a large number of economic analyses relating to telehealth, telemedicine and many other 'tele' technologies have been conducted. Four overlapping systematic reviews have summarised and assessed the quality of this evidence base.[29-32]

The most recent and up to date of these is a well conducted review of 80 economic analyses focussed on telehealth, telemedicine and telecare interventions. The review found a lack of reliable evidence that these technologies are cost-effective compared to conventional health care. Half of the analyses identified were cost consequence studies (that don't present a summary measure of benefit) and a quarter were cost minimisation analyses (that assume intervention equivalence). Included studies were characterised by poor reporting of costs and benefits and general lack of adherence to accepted methods of evaluation. The use of sensitivity analyses and an incremental approach were often lacking, limiting interpretation and generalisability.

The review also found that where individual analyses indicated cost effectiveness, the analyses rarely provided a threshold against which the relative value of the technology could be judged and decisions about willingness to pay/ adopt could be made. It is reasonable to say that this evidence is of limited value to decision making.

Two cost benefit analyses and one cost effectiveness analysis relevant to the specific scope of this briefing but not included in the four reviews were identified by our searches.[33-35]

The cost effectiveness analysis assessed home telemonitoring for patients with typical heart failure, who had recently been discharged from three acute hospitals in North West London.[33] Telemonitoring patients received usual care and had equipment installed in their home, to remotely monitor the signs and symptoms indicative of worsening heart failure on a daily basis. The monitored readings were transmitted to a base station in each participating hospital and reviewed on a daily basis by a heart failure nurse. Any variation from predefined criteria for the vital signs resulted in a telephone call with further patient assessment and advice.

The analysis found that at six months, telemonitoring produced similar outcomes to usual care, but reduced the number of out-patient and emergency visits, and 'unplanned' heart-failure hospitalisations at little additional cost (median cost per patient of £1,688 versus £1,498 for usual care). Though the study had some limitations (e.g. 40% of eligible patients consented to participate, no attempt was made to assess uncertainty), the conclusions appear appropriate.

The two identified cost benefit analyses are at the far more limited end of the evidence spectrum.[34, 35] The first provides a limited analysis of the costs associated with reduced hospitalisations experienced by patients with severe heart failure receiving intensive follow-up through a telemonitoring facilitated collaboration between Belgian GPs and a heart failure clinic. The Danish study presents a limited cost analysis of the reduced hospital admissions experienced over a very short time horizon (4 months) by patients diagnosed with severe COPD randomly allocated to receive telehealth monitoring and telerehabilitation.

Finally, in this briefing we have excluded activity analyses such as those presented in the recent evaluation of Yorkshire and the Humber Telehealth Hub.[36] Such analyses are even more limited than the evidence presented above as they fail to report resource use, costs and meaningful outcomes in any detail and lack appropriate comparative data (the 2020Health.org report uses data from a 10 year old sample of Medicare patients to calculate readmission rates for Hull, for example). These 'activity analyses' are not designed to demonstrate cost effectiveness and as such their value as evidence is questionable.

Implementation

Implementation of telehealth technologies in England is strongly supported by the Department of Health both through the continued promotion of the *3millionlives* initiative and incentivised through the *Innovation Health and Wealth* prequalification requirements for Commissioning for Quality and Innovation (CQUIN) payments.[37]

Worldwide, the largest single telehealth programme is provided by the Veterans Health Administration (VA) in the USA. A recent report by 2020health.org drew on the experience of the VA to propose a 10 point plan for introducing telehealth technologies across the NHS in England.[38] However, many of the factors favouring the introduction of telehealth technologies in the VA would be difficult to replicate in the NHS.

In particular, over 40% of the patients served by the VA live in geographically remote areas with difficulty accessing health care. The VA is a more centralised system than the NHS so telehealth was implemented as part of a major transformation of the whole system and supported by national decisions and economies of scale resulting from the use of a limited range of equipment and standard care pathways. Nationally designed and accredited care pathways are often lacking in the NHS.

Another important difference between the VA and the NHS is that the VA has a shared electronic health record for each patient. This allows telehealth data to be accessed by all relevant clinicians and used for deciding on treatment. In the absence of a common electronic patient record in the NHS, large scale implementation of telehealth technologies may be hampered by the need to develop systems for sharing of data between different providers.

The VA model involves care co-ordinators, often nurses, who co-ordinate all care needs for the patient and make use of local clinicians as telehealth ‘champions’. The recruitment and training of such a workforce could be challenging and would represent a further barrier to implementation. Likewise, fostering clinician engagement and buy-in may depend on much clearer evidence of benefit for specific patient groups than is currently available.

An organisational analysis of the implementation of the WSD intervention has emphasised the complexities involved in the telehealth programme in the NHS.[26, 39] It suggests that the level of system integration and local adaptation necessary for successful implementation was hampered by the time frame and the requirements of the study. Implementing telehealth systems more incrementally, at a pace that reflects the existing organisation of care and one that is aligned with the specific needs of the existing local context, may offer a better chance of success.

Expert commentary on the results of the WSD study has also emphasised the complexities involved in implementing any form of telehealth.[23] Key considerations include the type of technology and clinical context, the willingness and ability of clinical staff to change their care processes; the patients involved and their needs and expectations; the routine monitoring data collected and the endpoints that are used to specify success.

Health equity

The systematic reviews and other evidence sources included in this briefing provide some information about the relationship of telehealth and health equity. In health systems where significant numbers of people live in remote areas, telehealth can play a significant role in promoting equal access to health care. This is important both in Canada and in the US but is less likely to be a significant factor in the NHS. Health equity could be negatively affected if patients are selected for access to services on any basis other than clinical need, for example current access to fast broadband internet or other telecommunication services.

An exploration of barriers to patient participation within the WSD study identified three key themes.[27] Respondents held concerns that special skills were needed to operate equipment but these were often based on misunderstandings. Respondents' views were often explained in terms of potential threats to identity associated with positive ageing and self-reliance, and views that interventions could undermine self-care and coping. Finally, participants were reluctant to risk potentially disruptive changes to existing services that were often highly valued.

Conclusions

Although there is a large amount of evidence evaluating the effects of telehealth interventions, much of it is weak and/or contradictory. However, there is good evidence that telehealth monitoring can reduce mortality in patients with heart failure, particularly those recently discharged from hospital.

National policy currently favours the increased use of telehealth for people with long-term conditions. However, many of the conditions that have facilitated the successful large-scale implementation in other health systems are not replicated in the NHS.

Implementing telehealth systems more incrementally at a pace that enables greater system integration and local adaptation may offer a better chance of success than a 'big bang' approach. Monitoring resource use, patient experience and impact on clinical outcomes will be integral to any service deployment.

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