Supporting patient engagement with digital health care innovations

Lessons from the Care City test bed

Rachel Hutchings and Chris Sherlaw-Johnson

nuffieldtrust

Executive summary

While the Covid-19 pandemic led to a large increase in the use of technology in health care, many are concerned about the impact of the increased use of digital tools on access to services and quality of care, with the pandemic also putting a spotlight on the risks of digital exclusion. There is evidence of a 'digital inverse care law', whereby those most in need of support are least likely to engage with digital platforms. So while there is huge potential to use technology to actively reduce health inequalities, it is equally important to ensure that the use of digital tools does not inadvertently exacerbate existing inequality.

Digital exclusion is not just an issue within health care. Society-wide actions and policies are needed to address it through collaboration between health care, national and local government, industry and the voluntary sector. Many issues, such as cost or health literacy, can become barriers that affect an individual's use of technology – and all of these should be considered and addressed.

Like other health care systems around the world, the NHS is still facing considerable pressure from Covid-19, the backlog of care and rising demand. And while digital innovation has the potential to help alleviate some of these pressures, implementing it and supporting people to use it is not a quick fix.

The Care City Test Bed was a project involving the implementation of six digital innovations between June 2019 and August 2020. It aimed to test those innovations in a real-world setting to understand the factors that support patient and staff engagement in the use of digital health care innovations. The Nuffield Trust conducted a mixed-methods evaluation of the project, and this summary report brings together findings relevant to patient engagement with digital innovations.

Digital health innovations can be used to enhance care, but should not be framed as a replacement for face-to-face support. Instead, it is important to take a person-centred approach whereby digital tools are offered as part of a wider set of options based on an individual's particular preferences and needs.

For example, in designing the process, it is important to work with the intended users and the staff implementing the innovation in order to ensure that the proposed intervention is appropriate for the intended population. This means considering local context, and any unique features of the service that may affect implementation. Multiple complex factors can influence patient uptake and engagement with digital tools, such as the wider clinical context, people's individual attitudes towards their own condition, motivation and privacy concerns. It is important not to make assumptions about who will want to or be able to use technology, the level or type of support they might need or the barriers they might face: a person-centred approach is essential.

While digital health innovations may not work for everyone, there are things that can be put in place to optimise the process for those that use them. Our evaluation highlighted the following key points:

- The point at which the innovation is offered can have a significant impact – **face-to-face referral by a trusted person may influence the willingness of a person to begin using digital innovations**. Staff who offer innovations and support people to use them should receive sufficient training. This includes identifying and, where possible, addressing technical concerns that people have at the beginning, by providing support with downloading or getting started, for example. Ongoing training needs should be identified and addressed throughout.

- The process for implementing innovations and supporting people to engage can be time-consuming and resource-intensive – **capacity, time and resources should be built in to implementation programmes** to enable this to happen effectively.

- **Regular, ongoing support from the health care team is essential** – digital innovations are one part of a person's pathway of care and should be integrated with their wider care plan. Some initial concerns were raised by patients that they would not receive the same level of support from their health care team if they were using an app. It was therefore fundamental to reassure them that this would not be the case. **Maintaining access to existing modes of care is essential in order to ensure that those who do not wish to use digital innovations do not miss out**. It is important to recognise the value of friends and family in providing support and encouraging motivation, but also consider exploring opportunities for enabling peer support for people using digital health innovations.

- **Issues with technology access can arise throughout – it is not just an initial barrier and can affect ongoing engagement from people who would otherwise be keen to use technology** for their health care. Innovators and implementation teams should remain open and flexible to amending the innovations or the way they are being applied to address emerging challenges and improve accessibility.

The use of digital technology in health care has progressed rapidly and will continue to be a priority for the foreseeable future. Real-world evaluations are extremely important for understanding how best to implement technology for patients and staff to understand how to support patient engagement.

Our evaluation provided insight into a number of factors supporting engagement and it contributes to this rapidly evolving evidence base. The challenges and insights we identified are likely to be relevant to other health care systems, and other uses of digital technology within health care. However, the research was limited by challenges around data collection, and while we make some inferences from the data, further research is needed to understand the precise impact of these findings.

Introduction

Digital exclusion is a form of inequality and, like many other inequalities and social disadvantages, has been starkly highlighted through Covid-19 (Suleman, 2021). The pandemic has led to an increased use of technology across all areas of society, including health care (Hutchings, 2020), but concerns have been raised about the impact of the increased use of digital tools on accessibility of services, with the pandemic putting a spotlight on the 'digital divide' (Watts, 2020).

Digital exclusion can have an impact on health outcomes with regards to health care access (Stone, 2021), as well as exacerbate health inequalities caused by other factors such as socio-economic deprivation (Honeyman and others, 2020). There is also evidence that a 'digital inverse care law' exists, where those people most in need of support are least likely to engage with digital platforms (Davies and others, 2021).

Given the increasing prevalence of digital health tools and the role they will play in life beyond the pandemic, understanding the barriers to engagement and how to address them is essential for ensuring that everyone who wants to is able to benefit from them. It is important to understand who is more likely to experience digital exclusion, while also recognising that inequalities in health are a result of a complex interplay of factors. Intersectionality, which recognises that different factors interact with each other to shape people's experiences, is key. For example, the NHS Race and Health Observatory (2022) recently noted that although evidence is scarce, differences in digital inclusion relating to ethnicity, age and deprivation are likely to be the result of reduced digital literacy, access to devices and mistrust in how data would be handled.

Organisations have highlighted the importance of prioritising digital inclusion in post-Covid recovery (see, for example, Good Things Foundation, 2020). At a national level, Wales and Scotland have recently published digital strategies highlighting these issues as priority areas. Making sure nobody is left behind by the acceleration of digital transformation during the pandemic is also included within the UK government's 'Top Ten Tech Priorities' (Department for Culture, Media and Sport, 2021).

Although there are undoubtedly benefits to using technology in health care, such as greater convenience, a number of concerns have also been raised, including the risks of digital exclusion and consequences for patient access, and increasing inequity for people already at high risk (Healthwatch, National Voices and Traverse, 2020). Digital technologies will not be appropriate or desirable for everyone and it is important that other routes of access are available.

Healthwatch (2021) recently set out five principles for digital health care post-Covid, recognising the importance of maintaining a variety of routes of access, supporting people to have the care that is appropriate to their needs and prioritising inclusion by recognising access to the internet as a universal right. It is important that digital tools are offered as part of a person-centred approach whereby people are able to benefit from a range of options.

There are many different definitions of digital inclusion, and terms are also used interchangeably (The Strategy Unit, 2020). NHS Digital defines digital inclusion as:

- Digital skills (being able to use digital devices such as computers or smartphones and the internet)

- Connectivity (access to the internet through broadband, wi-fi and mobile)

- Accessibility (services need to be designed to meet all users' needs, including those dependent on assistive technology to access digital services).

Multiple barriers have been identified, including access, skills, confidence and motivation (NHS Digital, 2021).

Adopting technology successfully is a complex process and there a number of interrelated factors that are relevant, including the nature of the condition and technology itself, the willingness of the user and complexities within the wider system (Greenhalgh and others, 2017). Recent research exploring public attitudes to using data-driven technologies throughout the pandemic has also acknowledged the many different factors that affect a person's willingness to engage (Ada Lovelace Institute, 2021).

This research summary draws on lessons from a mixed-methods evaluation of the Care City Test Bed (see below). It summarises the findings from the evaluation related to supporting patient engagement and access and provides insight on how to address some of the issues that arose.

This is a complex topic and a wide variety of factors are relevant. These include individual as well as wider social and cultural factors, which can affect the ability and willingness of people to use technology to address a particular health care need (Sherlaw-Johnson and others, 2021). Other factors include health literacy – a person's ability to understand and use information to make decisions about their health (NHS Digital service manual, 2021) and patient activation – an individual's knowledge, skill, and confidence with managing their health and health care (Hibbard and Gilburt, 2014). There may also be broader factors which influence access and engagement, such as employment status or personal finances.

Our findings contribute to the rapidly developing evidence base on how digital innovations can improve patients' access to and experience of health care, and on what needs to be done for this to happen effectively.

Scope

Our evaluation was conducted within NHS and social care settings in England and focussed on the implementation of digital health innovations which support the management of long-term conditions. But the challenges and insights we identified are likely to be relevant to other health care systems, and other uses of digital technology within health care.

The Care City test bed

Care City is a community interest company based in East London and acts as an innovation partner to the local health and care system. The Care City test bed was a project involving the implementation of six digital innovations in East London between June 2019 and August 2020. It was one of the sites selected to be part of Wave Two of the NHS England Test Bed programme.

The Care City test bed aimed to determine the extent to which the selected digital innovations engaged service users, improved their outcomes and could alleviate some of the capacity challenges of the wider health and care systems. The digital innovations were used as follows in three settings.

- In primary care, which involved 'prescribing' digital support for the management of long-term conditions:

  - a digital platform providing cognitive-behavioural therapy (CBT) for people with insomnia

  - a digital platform connecting patients to health care professionals and a health coach to provide lifestyle, diet and exercise support to people with recently diagnosed type 2 diabetes

  - a home-based albumin-to-creatinine ratio (ACR) urine test for people with diabetes.

- In an acute hospital setting:

    - an app which provided remote cardiac rehabilitation (including education and exercise content) to people with heart disease.

- In domiciliary care, to regularly monitor and flag concerns around care users' health status:

    - a digital kit for measuring vital signs

    - a platform for digital urine analysis.

The Good Things Foundation, a digital inclusion charity, were a partner in the test bed project. Their role was to support co-design throughout the process. We conducted a process and outcomes evaluation of the project. More information on the Care City test bed and our evaluation can be found here including our full evaluation report and other outputs. This research summary focuses on our findings from primary and secondary care, because patients were the primary users of these innovations, unlike in domiciliary care where staff were the main users.

Key insights

Below we outline insights for implementing digital innovations throughout the implementation process.

Before implementation

It is essential that the use of digital health innovations is driven by user need, and not by the technology itself.

This means that interventions should be co-designed with relevant stakeholders in order to identify solutions and the ways that digital innovations might help to address particular issues. This may sometimes mean that a digital solution is not actually the right one. The Good Things Foundation have defined co-design as "a method of involving users, decision makers and practitioners in the process of design" (Stone and others, 2020). They have developed a set of co-design principles which were used in the Widening Digital Participation Programme and which have subsequently been used to inform the NHS Digital Service Manual's design principles – this includes being transparent, understanding underlying behaviour and challenging assumptions, and doing it in an environment where people feel comfortable and safe (NHS Digital Service Manual, 2018; Tinder Foundation, 2016). Co-design should involve everyone who might be affected by the intervention, including patients and professionals.

Co-design the intervention and implementation pathway with all relevant stakeholders

Care City, supported by the Good Things Foundation, organised co-design workshops with stakeholders before implementation in order to work through the proposed pathway and identify any potential issues. The evaluation team also organised logic model workshops with stakeholders. A logic model (or theory of change) is a visual representation of how the intervention is supposed to work, and why it is a good solution to the problem (Kumpunen, 2020). It also allows people to test any assumptions they may have about who

will or won't use the innovation, and identify any possible barriers that would affect how the innovation is used.

Who is involved in these discussions is of paramount importance, and a stakeholder mapping exercise may therefore be helpful so as not to miss anyone – this includes implementation leads, frontline staff and clinicians. Care City also conducted focus groups with patients to understand their perspectives on the use of the innovations. This process enabled people to discuss a number of issues related to patient engagement.

Consider local context

Co-design also allows consideration of local context, and wide variation may exist between services and populations. Literature has shown that complex interventions in health care and the context in which they are expected to have an impact are inter-related (Greenhalgh and others, 2020). But the balance between national spread and local implementation of digital health care innovations is an ongoing challenge. Although national spread may be desirable, and technologies may have a strong evidence base, local context may affect successful implementation, and innovations may need to be adapted to accommodate particular local needs (Hemmings and others, 2020).

A number of issues were identified as a result of these sessions. This included highlighting differences between services that would have an impact on implementation and how patients might engage – for example, there was considerable variation in workforce structures and organisational setup across primary care practices. The presence of specialised staff within the practices or services (such as a diabetes nurse or in-house blood testing facilities) was particularly beneficial for helping facilitate the implementation for the diabetes app and for providing leadership. However, it was also suggested that the innovations may have more impact on practices struggling to care for their diabetic population, rather than on those that already had good diabetes outcomes. Similarly, the cardiac rehab service had an in-house advocacy team whose role was to work closely with the local population and specific classes were organised for the local Bengali male community. This was considered important for implementation as there were existing services tailored to the local community.

Wider clinical context can also be relevant. For example, there was a feeling that there was a lack of a clear pathway for insomnia and a lack of awareness of the benefits of CBT to treat insomnia. This was considered a challenge to implementing the sleep app, because it did not fit within the traditional patient pathway, which affected staff knowledge and confidence.

Ensure the technology is appropriate for the patient population

In these initial stages, stakeholders considered that issues related to technology use would be the main barriers to patients using the innovations – issues such as people being uncomfortable using technology, a lack of confidence using apps, a lack of suitable smartphone or not having suitable access to the internet. But partners also noted a number of other barriers, one in particular being language, as all the innovations were primarily only available in English. This was felt to be a particular challenge with the cardiac rehab app, given that much of the local population were not fluent English speakers. During the implementation process, the innovator worked with the cardiac rehab team and their advocates to provide voiceovers for the app content in other languages. The providers of the diabetes app did employ health coaches who spoke different languages, although they weren't used for the test bed, and of the 67 individuals for whom a reason for declining this app was reported, 12 (18%) cited language issues.

Co-design early on also enabled the implementation teams to identify issues with the technologies themselves. As well as language, there were particular issues raised with some of the content of the cardiac rehab app, with the team wanting more video content covering warm-up and cool-down exercises. This was important for giving them the confidence that, clinically, the app was going to be suitable for the patient population and that patients with complex heart conditions would be able to exercise safely. The team were able to work with the innovator to produce additional content to address this.

Consider factors that might affect engagement

Motivation

Motivation was noted as a particular barrier for all of the innovations. But this was felt to be more to do with the programmes in general, rather than the digital element, as many required commitment over a number of weeks and months and, to a certain extent, a lifestyle change.

A study examining the use of remote monitoring for managing type 2 diabetes showed that those patients with higher patient activation and engagement had better clinical outcomes (Su and others, 2019). A number of barriers have been identified within the context of cardiac rehab uptake (such as the need for people to return to work or because of caring responsibilities) (British Heart Foundation, 2021). Before implementation, it was felt that an app might address some of these by enabling people to exercise in their own time and at a place of their choosing. But there was also hesitation about whether an app would address the root causes of low uptake of cardiac rehab, which was felt to be more related to lack of motivation to engage with cardiac rehab at all.

Some of these factors may be related to the nature of the condition itself. The cardiac rehab app was initially going to be targeted at heart failure patients, but this was widened out to people with other cardiovascular conditions (the majority of the team's referrals) who the team felt would be likely to benefit. This then required modifications to the app to make it appropriate for this patient group, such as providing more tailored educational content. The implementation team noted it as a reason that people with heart failure in particular would prefer face-to-face contact, as it would enable a health care professional to give them reassurance and guidance about what they were doing.

Trust, privacy and space

During co-design sessions with a cardiac rehab group, participants highlighted the issue of trust when accessing health information and how that would be an important factor influencing whether or not they would use an app. They also emphasised the importance of continuing to receive regular communication and support from the health care team, even if they weren't seeing them face-to-face.

The involvement of a trusted professional in onboarding was also noted as important in primary care, as well as the role of the health care team in following up with patients to check how they were getting on. Others noted the challenge of limited space at home – this would affect how far they would be able to use an app at home which contained exercise content (like the cardiac rehab setting). Others noted problems with maintaining privacy, if they hadn't necessarily told people who they lived with about their condition.

Offering the innovation

We found that how and when a person is offered the use of a digital innovation can affect their willingness to use it. Getting this right can help to address some of the concerns and hesitancies that people may have, as well as improving engagement. For this to happen effectively, staff involved in offering innovations should be sufficiently trained and confident to offer and explain them to patients.

It is important to not make assumptions about who will want to or be able to use technology based on particular characteristics. Likewise, just because someone is familiar with technology and uses it regularly does not mean they will want to use it for their health care. Similar findings were identified in the evaluation of the rapid scale-up of Near Me (which enables video consulting) in Scotland (Wherton and Greenhalgh, 2021). The evaluation conducted an extensive engagement exercise with patients and professionals and found that, prior to the pandemic, one of the barriers to uptake had been professionals making assumptions about who would benefit from using the technology. The barriers that staff might perceive won't necessarily materialise in practice – as we have outlined, many factors are relevant to a person's decision to use technology and it is important that people are offered the choice to make a decision that is right for them.

As such, taking a person-centred approach is critical, where digital tools are part of a range of options and support that is available which acknowledge the person's individual circumstances and preferences. This must take account of things such as patient activation and health literacy, as well as the importance of shared decision-making to make sure that the individual receives the support that is right for them.

Onboarding rates for the innovations included in the test bed are illustrated in Figure 1. These numbers are not fully comparable because people were approached in different ways depending on the app. With the cardiac rehab app, we did not have data on those patients who agreed to use the programme but never downloaded it. For three of the apps, numbers are broadly similar, whereas the ACR testing had much better rates of acceptance, with just over half of those approached undertaking the test. Factors which may explain some of these results are considered below.

Figure 1: Onboarding rates for apps included in the test bed: for people offered the apps and for people who agreed to use them
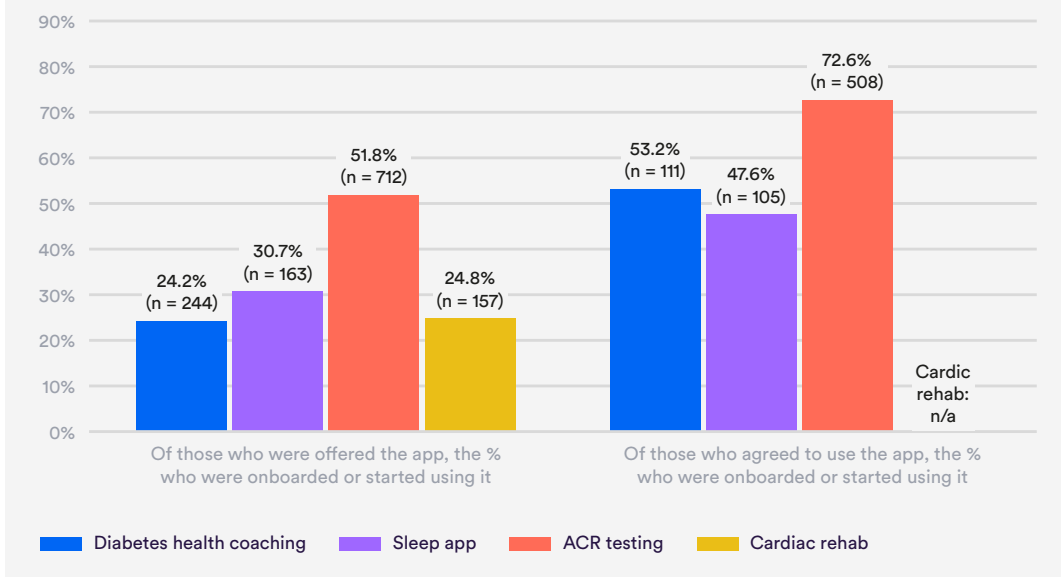
Consider access to technology and connectivity

Access to a smartphone was a prerequisite for using all of the innovations. Implementation teams noted either the absence of a smartphone or lack of confidence using a smartphone as a barrier to engagement. For example, of 145 individuals contacted as potential users of the diabetes app and for whom technical capability was recorded, 10 (7%) were reported as unsuitable because they did not have a smartphone or the ability to download apps onto their device.

Access to a smartphone is just one issue – connectivity was also highlighted as a barrier by patients. People had limited access to the internet or were concerned about not having enough storage on their phone for apps. Members of the cardiac rehab team noted 'data poverty' as a barrier among people who were hesitant about using the innovation, with people concerned about not having sufficient data or internet connection on their phone to support the app.

Data poverty is defined as "the inability to afford a sufficient, private and secure internet connection to meet essential needs"

(Good Things Foundation, 2021; Lucas and others, 2020).

The Covid-19 pandemic has resulted in an accelerated shift towards more online services, exposing this as a particular challenge. Research conducted by the Ada Lovelace Institute on attitudes towards the use of technology during the pandemic found that 19% of respondents said they did not have access to a smartphone, 14% did not have access to the internet and 8% had neither. Those with a disability, on annual incomes below £20,000 and the most clinically vulnerable were most likely not to have access to broadband or a smartphone (Ada Lovelace Institute, 2021). More recently, the Fabian Society has raised concerns about a widening "digital divide," noting the need for more affordable internet connections and access to digital training (Abey, 2022).

In 2021, Virgin Media 02 created the National Databank platform to provide free data to communities across the UK in order to help tackle this. The Data Poverty Lab is a collaboration between the Good Things Foundation and Nominet that aims to address data poverty across the UK by building on existing research and initiatives to develop solutions for tackling data poverty (Good Things Foundation, 2021). Community-led action is also vital for addressing this (Robinson and others, 2021). Public buildings such as libraries play an important role in providing people with this support, but their utility was limited by the pandemic.

Even when individuals had access to a smartphone, they did not necessarily want to use it for their health care. In 2020, the most common reasons for people using the internet in the previous three months were sending or receiving emails (85%) and finding information about goods and services (81%). 60% of people had used the internet for looking for health-related information and just 21% had used it for making an appointment with a health care professional, although use was higher for people with a disability (Office for National Statistics, 2020; Hutchings and Scobie, 2020). Within the cardiac rehab setting, some patients primarily used their phones for keeping in touch with friends and family abroad and were not confident using their phone for other purposes. Some people also had specific concerns around confidentiality and data protection. To respond to these issues, the innovator developed a 'frequently asked questions' document which explained the data protection processes in place.

Challenges were also associated with particular innovations. For example, the sleep programme was designed to be used on a computer, rather than on a phone. Although an app was available, it was intended to be used as a

supplement and was only available on iOS (Apple). This was considered a particular barrier for the local population – although people had smartphones, access to computers at home or Apple products was more limited. This also created confusion because people expected to be using an app rather than a web programme.

Supporting people to access the apps themselves (for example assisting with downloading) was important. With one of the apps, where people were sent a link and asked to access and download it in their own time, some people reported that they would have liked additional technical support with downloading or accessing the programme. This was also reflected in the view of one of the implementers. Where the innovator supported patients to download an app by talking them through the process while they were on the phone, this was considered beneficial, and may be one factor contributing to higher uptake of this innovation compared to the others.

Understand the reasons for people not wanting to use the innovation

Given our limited ability to capture information from users directly, we were to a certain extent reliant on how staff reported the reasons for declining and barriers that patients faced.

Some of the factors affecting uptake may be inferred from comparing the characteristics of people who engaged with those who did not. Age was an important factor associated with uptake of innovations (Figure 2) – with older age groups being significantly less likely to use them. However, we found no evidence of any link to gender. As a factor on its own, non-white ethnicity appeared not to be a barrier to uptake (Figure 3) and was positively associated with greater acceptance of the diabetes health coaching app. However, these differences may be explained to some extent by differences in age profiles of white and non-white groups (the latter being younger on average – see Table 1). A recent analysis conducted by the Ada Lovelace Institute concluded that ethnicity on its own was not associated with the likelihood of adopting digital technologies during the pandemic, but this is an area requiring further research (Ada Lovelace Institute, 2021).

Our analysis of ethnicity has remained broad due to the small numbers involved: we have combined separate non-white ethnic groups together which may hide important differences between specific communities. One such

difference was with language, which was noted as a particular challenge with the cardiac rehab programme (Table 2). A language issue was anticipated by the test bed and the team were able to work with the innovator to develop voiceovers to the videos in Bengali and Sylheti, the two non-English languages most commonly spoken in the local area. Although the numbers were small, uptake rate among Bengali/Sylheti speakers (13%) was significantly lower than among English speakers (36%), and all eight Bengali/Sylheti speakers who downloaded the cardiac rehab app did so after March 2020 when face-to-face classes were suspended. Thirteen patients with other first languages were also offered the cardiac rehab app, but the number of that cohort who downloaded it is too small to report. It appears that the voiceovers alone may not have been sufficient to enable comparable uptake with English speakers, but we do not know what the uptake would have been without them.

Figure 2: Comparisons of mean ages of those who choose to use each innovation with those who do not

Notes: With the diabetes health coaching app, the declined group also includes people who were eligible but did not have the technology.

People who agree to use the diabetes health coaching or ACR testing apps, but end up not using it, are not included.

Figure 3: Uptake of each technology, by ethnicity
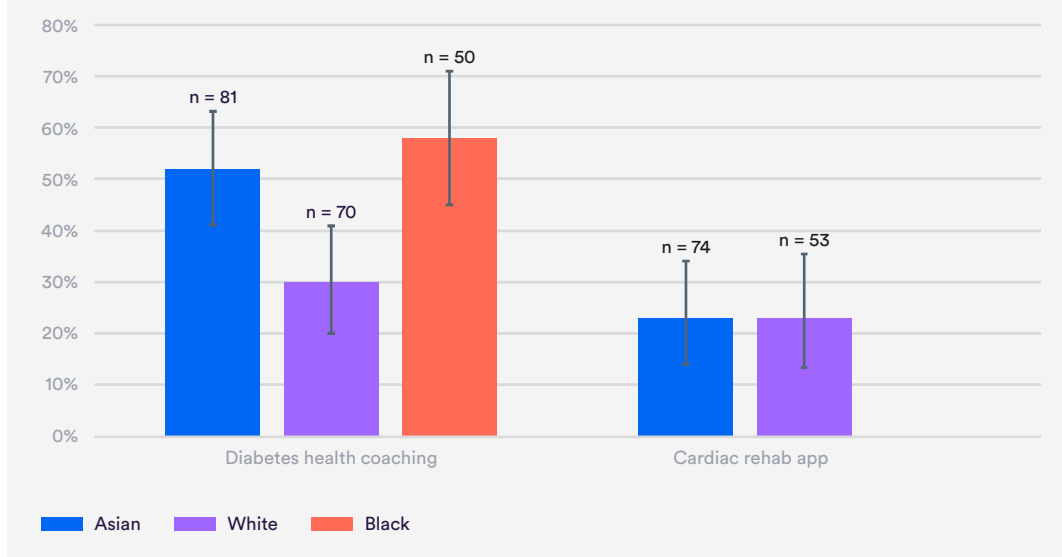
Notes: For the diabetes health coaching app, data shown are the proportions of people agreeing to take part within each ethnic group, rather than proportions actually onboarded. For the cardiac rehab app these are the proportions of people within each ethnic group who download the app.

There were too few people in the black ethnic group who were offered the cardiac rehab app for us to be able to display the proportions, and similarly with any other ethnic group not shown here.

Table 1: Average age of people eligible for the diabetes health coaching app, by ethnic group

Ethnicity	Number of people	Mean age (Standard error)	
Asian	82	46.3	(1.2)
Black	54	49.9	(1.4)
White	73	53.4	(1.3)
Mixed/other	7	47.4	(4.5)

Table 2: Variation in uptake by first language

	Referred	Started rehab	% started	Offered app	% offered	Downloaded app	Uptake of those offered
Bengali/ Sylheti	149	115	77.2%	60	52.2%	8	13.3%
English	189	120	63.5%	72	60.0%	26	36.1%
Other	51	27	52.9%	13	48.1%	*	*
Unknown	978	63	6.4%	12	19.0%	*	*
Total	1367	325	23.8%	157	48.3%	39	24.8%

* Low numbers have been suppressed.

The Care City team supporting the implementation reported that when referred, patients often seemed motivated to use the programme; however, often this did not translate into engagement. A wide variety of reasons for declining was reported. With the sleep programme, implementation staff and the Care City team reported a number of barriers to patient uptake and engagement, including language, the app not being available on an Android phone, other health conditions taking priority, patients being too busy, a preference for face-to-face care, and some patients expressed a preference for medication (an immediate solution to take home to help them sleep). The most frequently cited reason for patients declining the sleep app was because they were managing other health conditions – this was a particular issue with insomnia where patients felt other conditions were more important to address.

Some people declined as they felt that their condition was already being adequately managed – this was a particular issue with the diabetes app. Commitment was also a factor with some of the innovations (in particular the nine-month diabetes programme). There was some concern from patients about whether the dietary advice would be culturally appropriate. Health literacy and patient activation are important factors here, in terms of how far people are able to understand all of the relevant information and make a decision as a result. However, this was not something we were able to explore in this evaluation.

Conversely, where people were motivated to do something about their condition, this often stemmed from a need to 'try anything': use of the app being just one manifestation of this. For example, one person noted being "desperate to get some sleep" as their reason for wanting to use the sleep app. Another individual whose cardiac event occurred out of the blue was also motivated to take all steps available to reduce the risk of it happening again, and the app was just one part of this.

This illustrated the benefit of digital health innovations being used to enhance an individual's care rather than replace face-to-face interaction. Some people declined out of a preference for face-to-face interaction. For example, people valued face-to-face cardiac rehab because they were able to meet with others in the same situation and could benefit from practical support from the health care team.

All of this underlines the importance of avoiding making assumptions about who will engage with digital health innovations, and making a concerted effort to understand the barriers to engagement.

Introduction to the innovations – who, when and how may be important

As discussed, our findings suggest that the way someone is introduced to the innovation can be significant. In the primary care setting, face-to-face referral was seen as key, and referral and endorsement of the innovation by a trusted health care professional such as a GP or diabetes nurse seemed to be an important motivating factor for patient engagement.

The role of the person who makes the offer could therefore also be relevant. In the cardiac rehab setting, patients were onboarded to the app in their initial assessment with the cardiac rehab team. This was important not only because they were a trusted person, but because they could answer any questions or concerns (about the app itself but also the wider cardiac rehab programme and clinical implications) and also provide practical support to people by helping them to download the app. The implementation team considered that it was essential for a member of the cardiac rehab team to lead this given the wider clinical issues of the patient that may arise or questions they might have. Attitudes of staff may also be relevant, for example in how confident or enthusiastic they are about the innovations themselves and therefore their willingness to offer them to patients. It may be the case that the Covid-19

pandemic has had an impact on staff attitudes to technology, but this hypothesis should be properly evaluated.

Staff involved with implementation reported that making referrals to the programme face to face rather than on the phone was key for uptake. This is noteworthy considering the increase in remote care as a result of Covid-19, and recognises the need to understand where face-to-face contact is needed.

The recruitment method may also be relevant here – some of the innovations were advertised on posters and people could ask about them during consultations, whereas others were offered by the health care teams based on the person's clinical situation. Within the test bed, patients were invited to use the app through targeted recruitment, rather than just during routine consultations. Interviewees reflected that, in hindsight, more could have been done to support uptake and engagement in this way, by focussing on one-to-one conversations rather than relying on advertising in the surgeries.

In the cardiac rehab setting, a description of the app was added to the pre-assessment letter. It was mentioned during an initial telephone call during the implementation process to communicate that this was one of the options for doing cardiac rehab, rather than first hearing of it during an initial assessment. This meant that everyone attending their initial assessment was aware of the option and had time to reflect on it, and also demonstrated that the app was one part of the wider pathway rather than something separate. Although the exact impact of this on patients' willingness to engage was inconclusive, interviewees reflected that improved communications around the innovations could have an impact on engagement. In the primary care context, a script was developed to support practice staff when telephoning patients to see whether they would be interested in using the app. This reiterates the importance of ensuring that staff feel confident and trained to offer the innovations to patients – their role in uptake cannot be underestimated.

Timing of the offer may also be important. Patients who were interviewed and were engaging with the programme were referred during a GP consultation when raising sleep issues and therefore were motivated at that time to address their sleep difficulties. Meanwhile, patients referred retrospectively were less likely to engage, as their sleep problems were perhaps less of a priority at that moment and they were more likely to have been taking medication for a long time.

This was also relevant to other settings. Patients were offered the cardiac rehab app during their initial assessments with the cardiac rehab team following referral. Another study that examined the feasibility of a web-based cardiac rehab programme acknowledged the value of recruiting patients at the point of declining rehabilitation (>80% of recruited patients) rather than retrospectively – it was thought this was due to the influence of the health care professional (Houchen-Wolloff, 2018). Therefore, while people may be willing to use forms of remote or digital care, the initial referral is still likey to benefit from being face to face.

Training and support for staff

Staff should receive sufficient training and support to be able to offer the innovations to patients and feel confident assisting people with how to use them.

Other studies have also suggested that ensuring staff receive sufficient training is a key factor in supporting best use of remote care (Neubeck and others, 2020). Findings from the test bed interviews highlighted that staff hesitation at the beginning of the implementation process had an influence on their willingness to offer the innovation to patients. Implementation staff involved in the diabetes app also reported an increased openness towards digital prescribing. They said that it had helped them to recognise the value and potential benefits of digital apps and meant they were more willing to recommend alternative options for patients. It may be that the Covid-19 pandemic has enabled staff to be more open to the benefits of digital health innovations for their patients, but again this is an area that merits further exploration.

Supporting the recruitment process

The steps we have outlined above are not necessarily quick or easy – sufficient resources are needed to provide staff with the time and training to be able to do this effectively. Across the programme, we found that the process of recruiting users was more time-consuming and resource-intensive than anticipated. The involvement of Care City staff in recruitment (especially in the primary care setting) was extensive, partly as a result of limited capacity within the health care teams. With the ACR test, the innovator was heavily involved in the implementation process – something noted as a benefit by implementation staff given the pressure on their capacity. Our previous

research also highlighted the importance of hands-on support from the innovator during the implementation process in supporting scale and spread (Hemmings and others, 2020).

However, other innovators noted that there is a limit to what they are able to do and that, to a certain extent, they are reliant on the wider system to support the use of the innovation. This included referring people, collecting the right information (such as clinical measurements and consent) and explaining the innovation accurately to patients. Our previous research highlighted the importance of ensuring the workforce are engaged in the implementation and are also equipped to support it (Hemmings and others, 2020).

This should be factored in at a national policy and commissioning level. Implementing innovations is a time-consuming process and there should be sufficient funding to account for it, ensuring that it is not just funding the costs of the innovation itself (e.g. by individual licence), but the wider costs associated with embedding them within routine care.

Ongoing support and engagement

Implementing digital innovations is not just a case of introducing the technology – responding to challenges identified throughout implementation is important to improving both staff and patient experience, as well as providing ongoing support. It is therefore not possible to address digital exclusion just by giving people access to devices or connectivity. Programmes which aim to address digital exclusion should also recognise the importance of supporting people to use technology. This applies equally to patients and professionals. Our research for the NHS Innovation Accelerator (NIA) found that flexibility and adaptability on the part of the innovators was a key factor in supporting successful adoption because it meant they could tailor it to the particular context and respond to challenges along the way (Hemmings and others, 2020).

This is especially important within health care, where technology can be used to support and enhance people's experiences of care rather than being presented as a replacement. People with long-term conditions may experience multiple interventions, and there is a role for digital to play in supporting

this. Research conducted during the Covid-19 pandemic in the context of remote consultations has supported this "blended offer", to meet the needs of particular patients (Healthwatch, National Voices and Traverse, 2020).

The need for ongoing support

Overcoming initial barriers and supporting people to start using the innovation is just one step. Our evaluation highlighted the importance of providing ongoing support and interaction with the health care team. This is not only related to the innovation itself, but highlights the need to embed the innovation into the overall care pathway and the support the person is receiving. This supports findings from other research which highlight the importance of taking a hybrid approach and integrating digital technology within the person's care (HealthWatch, National Voices and Traverse, 2020).

There were clearly challenges in sustaining engagement. Of the 59 patients who were onboarded to the diabetes health coaching app, 28 (47%) were not actively engaging with the programme by the end of the nine months. Of the 50 patients who undertook the initial assessment with the sleep app, only 15 (30%) completed the first session of the programme. Of 39 patients who downloaded the cardiac rehab app, 26 (67%) completed the first week.

With the diabetes app, some patients were not clear on whether the programme supplemented or was a replacement for the support that they were getting from the GP practice – so it was important when introducing the app that practice staff explained to patients that they would still receive their usual care in addition to the innovation. This was identified early on in co-design sessions in the cardiac rehab setting, where one of the concerns about using an app for cardiac rehab was that people would be left to their own devices. Reassurance that this wouldn't be the case was an important part of people being willing to use the app. As a result, steps were put in place to address this. For example, the cardiac rehab team conducted weekly check-in calls with patients using the apps, and patients in the primary care context were supposed to receive follow-up calls. Feedback from patients throughout the project reiterated the importance and value of being regularly in touch with the cardiac rehab team to ask questions or receive practical and emotional support. It was also important that people knew who to talk to if they had particular issues. For example, health care staff in the primary care context informed patients that a helpline number was on the patient leaflet, to make them aware of the support available.

However, providing this level of support was at times challenging. For example, despite patients reporting the value of the diabetes programme, sustaining patient engagement proved challenging. Completion of the three-month health checks was relatively low – perhaps in part due to the responsibility for booking health checks being placed on patients (despite reminders being provided by the health coach) and there were some issues early on with implementation staff not being alerted by the GP patient records to the due date of the checks.

When the Covid-19 pandemic began, there was a shift in the level of support some people were given. The associated disruption of primary care services had the most notable impact on the health checks – leading to the checks at all practices being halted. Patient recruitment and follow-up calls to the sleep app which were scheduled to take place at three weeks and 12 weeks post-referral were suspended due to the impact of the pandemic on the priorities, capacity and resources of primary care services. Care City staff were no longer able to attend the practices to support the implementation and practice staff did not have the capacity. It is difficult to evaluate the impact of this on patient uptake, engagement and outcomes; however, it might well be expected that patients were less likely to use the programme when not receiving the support phone calls from practices. It is difficult to determine what the level of patient engagement with the innovations would have been were the health checks and follow-up calls not suspended. In the cardiac rehab setting, during the pandemic the calls became more important as people were not able to attend face-to-face cardiac rehab sessions.

Support from friends, family and peers
The importance of friends, family and peers in supporting the use of technology should not be underestimated and, where appropriate, their involvement can have a beneficial impact. This was evident in the primary care setting where such support for accessing and using digital innovations was highlighted as helpful for a number of people, particularly those who were less confident with digital technology. Patients using the cardiac rehab app noted how doing the exercises with family and friends enhanced their motivation.

Although this was not done in the test bed, interviewees noted the opportunity to facilitate more peer support or social interaction via the technology in order to replicate some of the aspects of face-to-face contact that they valued. This could include, for example, online forums. Some months into the pandemic, the cardiac rehab team began running online exercise classes which meant

people could see others doing the exercises at the same time. In light of the pandemic and ongoing pressure on health care services, exploring ways that technology could enable peer support to support people with long-term conditions may be of particular value.

Implications for policy and practice

This research summary discusses the findings from our evaluation relating to patient engagement, alongside practical insights on how to address these issues. This is not to say that technology will and should work for everyone – a person-centred approach is needed to recognise who could benefit from digital health innovations and ensure that those who want to are able to. These factors have also been highlighted in other projects. For example, remote monitoring models have also been used to manage patients with confirmed or suspected Covid-19 at home. Facilitators to patient engagement included accessible information for patients and carers, as well as training for them to use the equipment (in this case a pulse oximeter) and personalised support. A systematic review of remote monitoring to manage Covid-19 found that telephone-based models were more inclusive, given the potential for technology to act as a barrier to engagement (Vindrola-Padros and others, 2021).

The reasons that people do or do not engage with digital health tools are complex. Just because someone has access to technology does not mean they will necessarily want to use it for their health care. From our findings we identified 12 key lessons for policy and practice. These are:

1   **Co-design the innovation and implementation pathway with the intended users and staff** implementing the innovation. This includes considering local context, any unique features of the service that may affect implementation and whether the proposed intervention is appropriate for the intended population.

2   **Recognise that there are multiple complex factors that might influence patient uptake** and engagement including wider clinical context, individual attitudes towards their condition, motivation and privacy concerns.

3   **Do not make assumptions about who will want to or be able to use technology** and the level of support they might need – a person-centred approach is essential. This could mean offering the innovation to all service users.

4   **Consider factors which will affect uptake at onboarding** – including who introduces the innovation and when and how the offer is made.

5   **Staff who offer innovations and support people to use them should receive sufficient training**. This includes identifying and, where possible, addressing technical concerns that people have at the beginning by providing support with downloading or getting started. Ongoing training needs should be identified and addressed throughout.

6   **The process for implementing innovations and supporting people to engage can be time-consuming** and resource intensive – capacity, time and resources should be built in to implementation programmes to enable this to happen effectively.

7   **Innovators and implementation teams should be open to amending the innovations** or the way they are being applied to address emerging challenges and improve accessibility.

8   **Issues with technology access can arise throughout – it is not just an initial barrier** and can affect ongoing engagement from people who would otherwise be keen to use technology for their health care.

9   **Regular, ongoing support from the health care team is essential** – digital innovations are one part of a person's pathway of care and should be integrated with their wider care plan.

10 **Maintaining access to existing modes of care is also essential** to ensure that those who do not wish to use digital innovations do not miss out.

11 **Recognise the value of friends and family** in providing support and encouraging motivation.

12 **Explore opportunities for enabling peer support for people** using digital health innovations.

Limitations of this study and areas for further research

Our insights are drawn from our interviews and surveys with implementation teams, Care City staff and patients, as well as participant observations at co-design and training sessions. Where possible, we have included analysis of quantitative data on uptake and outcomes, although it was not always possible to make the useful links between clinical practice data and data collected by the apps themselves. Most of the feedback we received from the people who were using the innovations was positive, but overall, recruitment to the innovations was fairly low and less than expected. Furthermore, although we were able to capture some anecdotal information on the reasons that people declined the innovations reported by frontline staff, we were unable to conduct surveys or interviews with those individuals.

Our evaluation highlighted that uptake varied hugely, with uptake of the ACR test being the highest. We have suggested some reasons for this, but it may also reflect the fact it was only a one-off test, whereas the other innovations required a longer time commitment, reiterating the importance of considering motivation in supporting engagement. Whether that relates to the digital innovations themselves or motivation for the person to manage their health is less clear and is an area that requires further research.

We had intended to use the Patient Activation Measure (PAM) in our evaluation, but were unable to do so due to resource constraints within implementation teams. But exploring the relationship between patient activation and uptake of digital health innovations (as well as the role of health literacy) is an area that would benefit from further research.

Our evaluation has also reiterated the need to recognise connectivity (access to the internet) as a key part of digital exclusion. National and local action is required to tackle this from across health care, government, and the private and voluntary sector. This is not just an issue within health care, and a concerted effort across public services is required to address the barriers around digital exclusion. At a national level, organisations have called for a digital strategy to address these issues across society (see Good Things Foundation, 2020). Further research to explore the role of data poverty's effect on patient engagement with digital health innovations is important.

Understanding the characteristics of people using digital health innovations is also vital to learning more about who might be digitally excluded. Previous studies have shown that older people, people on lower incomes and those with a disability are more likely to be digitally excluded (Lloyds Bank, 2021). The relationship with age corresponds to our own findings and may reflect familiarity and confidence with using the technology and how willing people are to change from the modes of care they are used to, but this is an area that requires more exploration.

Concluding thoughts

Digital exclusion is not just an issue within health care – society-wide actions and policies are needed to address it through collaboration between health care, national and local government, industry and the voluntary sector. Despite the Covid-19 pandemic emphasising the opportunities that digital health innovations can bring, the wider impact on staff capacity and resourcing was challenging. These issues have not gone away and the NHS is still facing considerable pressure from Covid-19 with a backlog of care and rising demand. While digital innovation has the potential to help alleviate some of these pressures, implementing it and supporting people to use it is not a quick fix.

Digital health innovations can be used to enhance care but should not be framed as a replacement for face-to-face support. While digital health innovations may not work for everyone, there are things that can be put in place to optimise the process for those that do. Although not conclusive, this evaluation highlighted that the point at which innovations are offered can have a significant impact, and face-to-face referral by a trusted person may influence the willingness of people to begin to use them. We identified initial concerns raised by patients that they would not receive the same level of support from their health care team if they were using an app and it is was fundamental to reassure them that this would not be the case. Face-to-face interaction can therefore be built into the pathway even if someone is using a digital health innovation remotely.

Our evaluation provided insight into a number of factors supporting engagement which contributes to this rapidly evolving evidence base. But it was limited by challenges around data collection, and while we make some inferences from the data, further research is needed to understand the precise impact of these findings. The use of digital technology in health care has progressed rapidly and will continue to be a priority in the coming months. Real-world evaluations are extremely important for understanding how best to implement technology for patients and for staff to understand how to support patient engagement.

References

Abey J (2022) Bridging the divide: tackling digital inequality in a post pandemic world. The Fabian Society. https://fabians.org.uk/wp-content/uploads/2022/04/Bridging-the-Divide-web-file-Fabian-Society.pdf

Ada Lovelace Institute (2021) The data divide: Public attitudes to tackling social and health inequalities in the COVID-19 pandemic and beyond. www.adalovelaceinstitute.org/wp-content/uploads/2021/03/The-data-divide_25March_final-1.pdf

British Heart Foundation (2021) The National Audit of Cardiac Rehabilitation Quality and Outcomes Report 2020. www.bhf.org.uk/informationsupport/publications/statistics/national-audit-of-cardiac-rehabilitation-quality-and-outcomes-report-2020#

Davies AR, Honeyman M, Gann B. Addressing the Digital Inverse Care Law in the Time of COVID-19: Potential for Digital Technology to Exacerbate or Mitigate Health Inequalities. J Med Internet Res. 2021 Apr 7;23(4):e21726.

Department for Culture, Media and Sport (2021) Our 10 Tech Priorities. https://dcms.shorthandstories.com/Our-Ten-Tech-Priorities/index.html

Good Things Foundation (2020) Blueprint for a 100% Digitally Included UK: For a post-COVID-19 economy www.goodthingsfoundation.org/wp-content/uploads/2021/01/blueprint-for-a-100-digitally-included-uk-0.pdf

Good Things Foundation (2021) Partnering to bring an end to Data Poverty. www.goodthingsfoundation.org/what-we-do/news/good-things-foundation-and-nominet-seek-end-to-data-poverty

Good Things Foundation (2021) 'What is data poverty? www.goodthingsfoundation.org/data-poverty-lab

Greenhalgh T, Maylor H, Shaw S, Wherton J, Papoutsi C, Betton V, Nelissen N, Gremyr A, Rushforth A, Koshkouei M and Taylor J (2020) 'The NASSS-CAT

tools for understanding, guiding, monitoring, and researching technology implementation projects in health and social care: protocol for an evaluation study in real-world settings', *JMIR Research Protocols* 9(5), e16861, doi: 10.2196/16861.

Greenhalgh T, Wherton J, Papoutsi C, Lynch J, Hughes G, A'Court C, Hinder S, Fahy N, Procter R, Shaw S Beyond Adoption: A New Framework for Theorizing and Evaluating Nonadoption, Abandonment, and Challenges to the Scale-Up, Spread, and Sustainability of Health and Care Technologies J Med Internet Res 2017;19(11):e367

Healthwatch (2021) Locked out: Digitally excluded people's experiences of remote GP appointments. www.healthwatch.co.uk/sites/healthwatch.co.uk/files/Digital%20Exclusion%20v4.pdf

Healthwatch, National Voices and Traverse (2020) The Doctor Will Zoom You Now: getting the most out of the virtual health and care experience. www.healthwatch.co.uk/sites/healthwatch.co.uk/files/The_Dr_Will_Zoom_You_Now_-_Insights_Report_0.pdf

Hemmings and others (2020) Achieving scale and spread: Learning for innovators and policy-makers. Nuffield Trust. www.nuffieldtrust.org.uk/research/achieving-scale-and-spread-learning-for-innovators-and-policy-makers

Hibbard and Gilburt (2014) Supporting people to manage their health An introduction to patient activation. King's Fund. www.kingsfund.org.uk/sites/default/files/field/field_publication_file/supporting-people-manage-health-patient-activation-may14.pdf

Honeyman and others (2020) Digital technology and health inequalities: a scoping review. Cardiff: Public Health Wales NHS Trust https://phw.nhs.wales/publications/publications1/digital-technology-and-health-inequalities-a-scoping-review

Houchen-Wolloff L, Gardiner N, Devi R, Robertson N, Jolly K, Marshall T, Furze G, Doherty P, Szczepura A, Powell J, Singh S. Web-based cardiac REhabilitatioN alternative for those declining or dropping out of conventional rehabilitation: results of the WREN feasibility randomised controlled trial. Open Heart. 2018 Oct 8;5(2):e000860.

Hutchings (2020) The impact of Covid-19 on the use of digital technology in the NHS. Nuffield Trust. www.nuffieldtrust.org.uk/files/2020-08/the-impact-of-covid-19-on-the-use-of-digital-technology-in-the-nhs-web-2.pdf

Hutchings and Scobie (2020) Chart of the week: disabled people more likely to use the internet for health-related activities than non-disabled people. Nuffield Trust. www.nuffieldtrust.org.uk/resource/chart-of-the-week-disabled-people-more-likely-to-use-the-internet-for-health-related-activities-than-non-disabled-people

Kumpunen (2020) Using logic models to evaluate innovations in health care. Nuffield Trust. www.nuffieldtrust.org.uk/news-item/using-logic-models-for-evaluating-innovations-in-healthcare

Lloyds Bank (2021) UK Consumer Digital Index 2021. www.lloydsbank.com/assets/media/pdfs/banking_with_us/whats-happening/210513-lloyds-consumer-digital-index-2021-report.pdf

Lucas, Robinson and Treacy (2020) 'What is data poverty? Nesta and Ylab. https://media.nesta.org.uk/documents/What_is_Data_Poverty.pdf

McGillicuddy JW, Weiland AK, Frenzel RM, et al. Patient attitudes toward mobile phone-based health monitoring: questionnaire study among kidney transplant recipients. J Med Internet Res 2013;15(1):e6.

Neubeck L, Hansen T, Jaarsma T, Klompstra L and Gallagher R (2020) 'Delivering healthcare remotely to cardiovascular patients during COVID-19: a rapid review of the evidence', *European Journal of Cardiovascular Nursing* 19(6), 486–94, doi: 10.1177/1474515120924530.

NHS Digital (2021) 'What we mean by digital inclusion' https://digital.nhs.uk/about-nhs-digital/our-work/digital-inclusion/what-digital-inclusion-is

NHS Digital Service Manual (2021) Health literacy. https://service-manual.nhs.uk/content/health-literacy

NHS Digital Service Manual (2018) Design Principles. https://service-manual.nhs.uk/design-system/design-principles

NHS England (2019) NHS Long Term Plan www.longtermplan.nhs.uk

NHS England (no date) NHS Test Beds programme. www.england.
    nhs.uk/aac/what-we-do/how-can-the-aac-help-me/test-beds/
    nhs-test-beds-programme

Office for National Statistics (2020) Internet access – households and
    individuals www.ons.gov.uk/peoplepopulationandcommunity/
    householdcharacteristics/homeinternetandsocialmediausage/
    datasets/internetaccesshouseholdsandindividualsreferencetables

Robinson, Lucas and Cripps (2021) Making connections: Community-led
    action on data poverty. Local Trust. https://localtrust.org.uk/insights/
    research/making-connections-community-led-action-on-data-poverty

Scottish government (2021) A changing nation: how Scotland will thrive in
    a digital world www.gov.scot/publications/a-changing-nation-how-
    scotland-will-thrive-in-a-digital-world

Seto E, Leonard KJ, Masino C, et al. Attitudes of heart failure patients and
    health care providers towards mobile phone-based remote monitoring.
    J Med Internet Res 2010;12(4):e55.

Sherlaw-Johnson and others (2021) Evaluation of the Care City Wave 2 test
    bed: Final report. Nuffield Trust. www.nuffieldtrust.org.uk/files/2021-05/
    care-city-full-evaluation-report-web.pdf

Stone (2021) Digital exclusion & health inequalities: Briefing paper. Good
    Things Foundation. www.goodthingsfoundation.org/insights/
    digital-exclusion-and-health-inequalities

Stone, Nuckley and Shapiro (2020) Digital Inclusion in Health and
    Care: Lessons learned from the NHS Widening Digital Participation
    Programme (2017–2020) www.goodthingsfoundation.org/insights/
    digital-participation-lessons-learned

Su D, Michaud TL, Estabrooks P, Schwab RJ, Eiland LA, Hansen G, DeVany
    M, Zhang D, Li Y, Pagán JA, Siahpush M. Diabetes Management Through
    Remote Patient Monitoring: The Importance of Patient Activation
    and Engagement with the Technology. Telemed J E Health. 2019
    Oct;25(10):952-959.

Suleman and others (2021) Unequal pandemic, fairer recovery: The COVID-19 impact inquiry report. Health Foundation. www.health.org.uk/publications/reports/unequal-pandemic-fairer-recovery

The Strategy Unit (2020) Improving Digital Health Inclusion: evidence scan. www.strategyunitwm.nhs.uk/sites/default/files/2021-04/Digital%20Inclusion%20evidence%20scan.pdf

Tinder Foundation (2016) Health and Digital: Reducing inequalities, improving society. www.goodthingsfoundation.org/wp-content/uploads/2016/07/Health-and-Digital-2016.pdf

Vindrola-Padros C, Singh KE, Sidhu MS, Georghiou T, Sherlaw-Johnson C, Tomini SM, Inada-Kim M, Kirkham K, Streetly A, Cohen N, Fulop NJ. Remote home monitoring (virtual wards) for confirmed or suspected COVID-19 patients: a rapid systematic review. EClinicalMedicine. 2021 Jul;37:100965.

Watts G. COVID-19 and the digital divide in the UK. Lancet Digit Health. 2020 Aug;2(8):e395-e396.

Welsh government (2021) Digital strategy for Wales. https://gov.wales/digital-strategy-wales-html

Wherton and Greenhalgh (20210 Scottish government. Coronavirus (COVID-19) – Near Me video consulting service: evaluation 2020 – summary report www.gov.scot/publications/evaluation-near-video-consulting-service-scotland-during-covid-19-2020-summary-report/documents

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