Virtual Health:
Rapid review of evidence and implications

Prepared for Waikato DHB

Adrian Field PhD

Rachael Butler

4 May 2018

dovetail
Building Insight for Action and Change

Waikato District Health Board

Contents

Recommended citation: Field A., Butler R. 2018. *Virtual Health: Rapid review of evidence and implications*. Hamilton: Waikato District Health Board.

1. Summary of key findings

Introduction

This review explores approaches to virtual health technologies and services, including the benefits and challenges of their delivery, technology adoption and their potential to support patient-centred care. The report was developed with a view to supporting Waikato DHB's virtual health strategy and programme.

Four overarching questions have guided this review:

1. What are the needs, opportunities, and benefits of a virtual health programme in a publicly-funded health system?
2. What evidence-based approaches support and achieve changes in clinical practice, and what are the implications for virtual health systems?
3. What does it mean to be patient-centred and what are the changes that are needed?
4. What are the system changes that are needed to support virtual health uptake by clinicians, patients and their families?

What is virtual health?

Virtual health is an emerging concept and encompasses existing remote methods of healthcare delivery such as telehealth and telemedicine. Some anticipate that it will comprise a substantial proportion, if not the majority of patient interactions in the future. However, it is widely acknowledged that implementing technology projects in healthcare is not without its challenges, not least because of the complex processes of change required at both the organisational and individual levels.

Virtual health, telehealth, telemedicine and other related terms are often used interchangeably in the literature. In the strategic context of Waikato DHB, virtual health is proposed as the integration of personal, whānau and societal determinants of health that creates a whole of person wellness. This positions virtual health as a significant developmental (or 'evolutionary') step beyond telehealth and digital health approaches, which is patient-centred and engages people as partners with clinicians in maintaining and improving their health.

Virtual health benefits and opportunities

Challenges facing healthcare systems such as ageing and rising populations, increased life expectancy and an increase in chronic diseases have contributed to an investment in virtual health care as a means of reducing costs, increasing patient access, and improving care. As a value proposition, virtual health initiatives have the potential to deliver patient-centric care, create more collaborative ways of working and introduce health system efficiencies.

Potential benefits for patients are wide-ranging, although many of the advantages of virtual health are linked to specific initiatives, population groups or health conditions, and there is some evidence that it is not consistently superior to usual care. Reported benefits include improved access to healthcare and health and wellness education, increased patient engagement and satisfaction, a reduction in direct and indirect costs, and improved health outcomes. While virtual health is considered an opportunity to reach marginalised populations and those living in remote areas, they may face barriers to uptake (e.g. accessing and paying for services).

Virtual health programmes have been linked to positive outcomes for health providers, including improved operational efficiencies, a reduction in costs, alleviation of staff/provider shortages, and access to a pool of clinical resources. As with patient benefits, systemic advantages can vary depending on the nature of the intervention.

Clinician uptake of virtual health

Clinician acceptance has been identified as the most important factor for sustained implementation of technological innovation in health services. However, clinical staff may resist these new developments due to a belief that relationships and therapeutic interactions will be compromised, a perceived lack of value in new ways of working, and concerns about the safety and accuracy of new technology. A range of strategies have been recognised as influential in facilitating clinician acceptance of new technologies within the healthcare setting, including:

- **Organisational context** – the 'readiness' of the organisation to implement the technology and support staff during the process is vital. This includes an organisational culture that is receptive to change, management strategies to ensure limited disruption to workflow, and senior leadership who demonstrate support for, and commitment to, the implementation process.
- **Clinical champions** – these individuals can facilitate clinician acceptance of new systems and technologies via the promotion of interventions, modelling appropriate behaviour and attitudes towards new technology, and motivating colleagues to adopt new practices.
- **Clinician involvement in design, selection and implementation of new technology** – the involvement of frontline staff in the design and implementation of new healthcare systems and technologies will help to engender support for the process, overcome resistance, and ensure that new systems are fit for purpose. This can include involvement in the redesign of work routines, IT selection, and implementation processes. It should entail open communication and dialogue, ensuring clinician input into the decision-making processes whilst also allowing space for concerns to be voiced.
- **Equipment and technology** –needs to be reliable, accurate, and easy to use. It must be seen to be useful (i.e. fulfilling a clinical need and not creating additional work). There should be scope for clinicians to use new technology creatively and the capacity to customise to meet changing needs and contexts of use, where appropriate.
- **Training** – clinicians who are familiar with, and confident using, technology are more likely to engage in virtual interventions. Adequate training will therefore play a key role in determining whether or not new technologies are adopted by clinicians and shape their potential integration into clinical practice. Training should be undertaken early in the process, be context-specific, and provide space for addressing staff concerns.
- **Social networks –** peer networks and communities of practice may advance the use of new technology and help users develop the skills and knowledge required to utilise new systems via bringing clinicians together to solve problems and share expertise.

In addition to the above, the literature highlights the importance of broader systemic and organisational considerations in the implementation of technology projects in healthcare. This includes acknowledgement of the complexity of tasks and systems involved, alongside the social nature of the process, which may be open to different interpretations by various stakeholders with conflicting interests. Further, it may be considered a political process, with a potential shift in power dynamics and one which poses a threat to staff roles and identities. Finally, the value proposition for staff is a key consideration, and must be clearly communicated prior to, and during, the implementation process.

Patient-centred care and virtual health

The strategic context of this review positions virtual health as a significant developmental (or 'evolutionary') step beyond telehealth and digital health approaches, which is patient-centred and engages people as partners with clinicians in maintaining and improving their health.

As a concept, patient-centred care has been in existence for some time, and there is growing recognition and acceptance of the need to adopt this approach within the delivery of healthcare. The definition of patient-centred care can vary depending on the setting or perspective being represented, and it may be conceptualised in different ways by various stakeholders. Overall, however, this brief review has identified a number of common elements to patient-centred care, including:

- Respect for patients
- Patient participation and involvement
- Physical comfort and emotional wellbeing addressed
- Patients and health professionals working in partnership
- Effective communication
- Involvement of family
- Coordinated and integrated approach to care
- Health promotion to reduce the likelihood of future illness.

Within New Zealand, patient-centred care has the potential to address health disparities, where services are delivered by culturally competent health professionals. Other practical examples of patient-centred care include customised medications, self-care support, hospitals which facilitate family involvement, and family members and patients participating in the design of health settings.

Reported benefits of patient-centred care include reduced health costs, improved health outcomes and patient satisfaction, increased morale and productivity among clinicians and other staff, and a reduction in both underuse and overuse of healthcare services.

Complementing patient-centred care is a growing focus on self-management support, by equipping people and their families to be active participants in health, particularly for people dealing with long-term conditions. There is some evidence to suggest that self-management programmes equip people with confidence to manage their health and to address some markers of long-term conditions. Recent thinking in this area stresses a focus on the broader circumstances of people's lives at the individual, family, community, economy and systems levels.

This review points to a range of areas where virtual health can be a key driver of patient-centred care, including the following:

- Design and application of digital tools to support health management and improvement
- Tailored information and resources that align with a person's health, social and cultural needs

- Web-based and other electronic interfaces connecting patients with their clinicians and providing accessible treatment plans
- Access to patients' own health records
- Improved connections between healthcare providers to better integrate patient care
- Interactive mapping of health care services and resources to support the patient journey
- Engagement with wider family networks using virtual health tools.

Key enablers for virtual health

Available evidence indicates a range of foundations are needed to support virtual health systems. These include acknowledgment of the relationship between social, technological and organisational factors, the ability to adapt and innovate within organisations, and senior leadership support within a workplace environment which is prepared, agile and robust. Introduced technologies need to be secure, offer advantages over existing practices, and be perceived as easy to use.

Users of virtual health systems should be involved in the planning and implementation of new initiatives, be adequately trained, and feel confident that the technology is safe, offers demonstrable benefits, and is easy to use.

There are several challenges for DHBs in implementing virtual health approaches, that arise from the funding and organisational structures for public health systems in New Zealand. These include the funding models that drive services, the fragmentation of clinical and population health services, and the extent to which DHBs can successfully influence and foster innovation adoption within and outside their organisations. There also appears to be substantial variation in capacity and readiness for virtual health among DHBs.

Particular consideration should be given to the approaches needed to successfully deliver virtual health to population groups with high health need, including Māori, Pacific people, rural populations, and people from more deprived communities.

There are many change management approaches that can support virtual health uptake. These are likely to be particularly helpful in supporting organisational culture and responsiveness.

Health organisations and systems are increasingly adopting human-centred design processes to the design of tools and services; this is to better reflect the needs and challenges of people as they traverse health systems, through iterative processes of problem definition, user journeys, innovation co-design, testing and refinement. There is also a shift towards involvement of lay people in clinical governance at multiple levels in health systems.

Conclusions

The evidence from this review is that virtual health approaches are steadily emerging as important components of healthcare systems. They offer the potential to improve access for remote and underserved populations. The learning from widespread efforts internationally is that the quality of the design and technology, the strength of engagement with users (both clinicians and patients), and the readiness of organisations to support the change process, are all key determinants of their ultimate value to health systems. Virtual health approaches that meet the needs of their users, and are seen to be useful, beneficial and relevant, are intrinsic to their success.

2. Introduction

Background to this review

Waikato DHB's virtual health programme[1] is a significant reframing of the organisation's service model. It embodies a shift in focus from that of provider to one which is patient-centric and reflective of their needs. It is intended that this approach will support the active engagement of people in managing their own health, increase access to knowledge for patients[2] and clinicians, and provide new forms of access to health services.

This poses a number of potential challenges for the DHB. Of note, it is intended to support change to different working models, adoption of new technological frameworks, and a shift in focus to cohorts and populations, rather than case-by-case services.

As a means of informing the organisation's Virtual Health Strategy, an analysis of evidence-based learning on the development and implementation of virtual health approaches was undertaken. This took the form of a staged series of rapid reviews, which focused on the strategic issues of supporting clinician uptake of virtual health and a transition to virtual models of service delivery. It is intended that this work will complement a parallel review of aspects of the SmartHealth system, and provide a future-focused analysis of challenges and opportunities for virtual health approaches.

Each rapid review focused on one of the following key questions in turn:

1. **What are the needs, opportunities, and benefits of a virtual health programme in a publicly-funded health system?**
2. **What evidence-based approaches support and achieve changes in clinical practice, and what are the implications for virtual health systems?**
3. **What does it mean to be patient-centred and what are the changes that are needed?**
4. **What are the system changes that are needed to support virtual health uptake by clinicians, patients and their families?**

This document presents the synthesised findings of this process, with the structure of the main body of the report based around these questions.

Approach

The reviews that informed this report were undertaken to provide robust evaluative analysis that will support rapid translation into actions by the DHB. They were intentionally designed to support strategic and service planning, and to avoid the time and budget requirements of more intensive systematic reviews. As such, they focused on recent evaluative thinking in this space, rather than a detailed exploration of one-off independent studies.

In sourcing appropriate material, databases including Scopus, PsycINFO, ScienceDirect, and Google Scholar were searched, supported by electronic searches on Google. This was supplemented by a snowball approach which involved reviewing the reference lists of identified literature as a means of

---

[1] See: https://waikatodhbnewsroom.co.nz/2016/05/12/waikato-dhb-launches-first-nz-virtual-health-service/

[2] The term patient is used throughout this document to refer to users of health services.

locating further sources. To ensure the dataset fit within the timeframes and scope of the review, systematic and other reviews were used as far as possible, with selected individual papers included where appropriate, and to provide further richness to the synthesis.

These approaches identified a broad range of publications from the grey and academic literature which were subsequently reviewed and selected for inclusion in the review. Analysis was thematic in its approach, and involved identifying and synthesising the key concepts which were then summarised and reported within each of the topic areas covered by the review.

3. The emergence of virtual health

Approaches to virtual health

Virtual health can be viewed as the next wave of development in the e-health space, which extends current telehealth and telemedicine[3] approaches. Still considered to be at an early stage of development, it is anticipated that virtual healthcare will comprise the majority of patient interactions in the future (Jamieson et al 2015).

While the terms are often used interchangeably, virtual health may be considered a broader concept than telehealth and telemedicine (Accenture Consulting 2015, Jamieson et al 2015), and one which involves the application of technology within the healthcare setting to improve service delivery, information flow and, ultimately, health outcomes (Jamieson et al 2015). It is concerned with connecting a wide range of stakeholders, including patients and caregivers, care teams and health professionals, as well as broader players such as health institutions and the government (Accenture Consulting 2015, Jamieson et al 2015). One definition put forward by the Women's College Hospital Institute for Health Systems Solutions and Virtual Care (WIHV) is as follows:

> *Any interaction between patients and/or members of their circle of care, occurring remotely, using any forms of communication or information technologies, with the aim of facilitating or maximising the quality and effectiveness of patient care.* (p. 4) (Jamieson et al 2015)

Virtual health seeks to improve access to services whilst also reducing costs (Jung & Padman 2014, Meyer 1996, Nelson et al 2017) and maximising quality and effectiveness of patient care (Jamieson et al 2015). It prioritises patients' needs (Jamieson et al 2015, Meyer 1996) and supports their self-management of health-related issues (Accenture Consulting 2015). Jamieson et al (2015) propose three key areas where virtual health offers value:

- It empowers patients and facilitates patient-centric care
- It overcomes challenges associated with a siloed health system via improved communication and collaboration, shared accountability and contingency planning
- It reduces waste and improves efficiencies by increased knowledge and data sharing.

---

[3] Telehealth or telemedicine may be considered a subset of e-health and has been described as the delivery of clinical services from a distance (Wade, 2014; Morrison, 2014). Other definitions of telehealth focus on the use of remote devices to monitor people's health (Brewster, 2014; Greenhalgh, 2017).

Virtual health is not linked to a particular technology (Jamieson et al 2015) and may encompass several modalities – e.g. asynchronous, synchronous, and hybrid (Harrop 2001, Nelson et al 2017). Wilson and colleagues (2016) propose four levels of virtual healthcare as follows:

1. Single isolated technologies (e.g. mobile health applications that provide health resources and education).
2. Single electronic health services that can be synchronously or asynchronously integrated into a healthcare system (e.g. video consultations with doctors).
3. Virtual primary clinics that incorporate both face-to-face interaction and diagnostic tools.
4. Virtual healthcare systems, which incorporate both virtual add-ons to an existing system and complete virtual healthcare systems.

Examples of virtual health initiatives include teleconsultations, remote monitoring of patients, electronic messaging, telehealth medication dispensers, electronic health records, video outpatient consultations and Bluetooth electronic dispensers (Greenhalgh et al 2017b, Jamieson et al 2015, Nelson et al 2017).

Given that virtual health is an emerging field, there is limited published evidence on its development and achievements to date. In undertaking this review, therefore, much of the material draws on learnings from telehealth and telemedicine. In addition, we have looked to the broader lessons from health technology adoption literature and considered implications for virtual health.

New Zealand context of virtual health

It was outside the scope of this work to review the current landscape with regard to existing models of virtual healthcare within New Zealand. However, some local and national examples of emerging virtual health initiatives were identified while undertaking the evidence reviews, which suggests that this is a developing area. These tended to be individual telehealth or telemedicine initiatives rather than more extensive virtual health programmes. This finding is supported by a recent stocktake of telehealth activity across the country's DHBs, which identified that New Zealand was 'close to a tipping point' with regard to the uptake of telehealth practices (particularly videoconferencing). However, the authors noted that most services were introduced as a means of improving an existing model of delivery, rather than at a broader strategic level to reconfigure the way patients receive care (Kerr 2014).

Some examples of current virtual health offerings within New Zealand are outlined below:

- **iMOKO™**: this is a virtual health project, initially operating in Northland (but extending to other parts of New Zealand), which facilitates communities' involvement in health services delivery (Dale 2017, Henry et al 2017, Navilluso Medical Ltd 2018). It involves the placement of smart tablets into schools, with iMOKO™ software installed, to allow information on health issues to be collected within these settings. Individuals are trained to conduct health assessments with data subsequently interpreted by a virtual telehealth team, allowing for prompt diagnosis and treatment. This includes, for example, prescriptions being sent back to the children's caregivers, who are also able to access patient information via an app. Free health checks are also provided for children. It has been reported that, by the end of 2016, 4000 children across a range of educational settings were receiving this form of healthcare (Navilluso Medical Ltd 2018).

- **MAiHEALTH™**: described as 'pop-up virtual medical centres' these clinics connect patients with doctors in other locations via devices such as iPads. The first clinic (a collaboration between Ngāti Ruanui and Dr Lance O'Sullivan) was established in Patea[4] as a means of addressing the lack of a local GP. The service is free and run Monday-Friday by local community members. These individuals, trained as 'digital health deputies', use the MAiHEALTH™ app to make health assessments and submit the information to a cloud-based team of health professionals. Following a diagnosis, and if required, prescriptions are sent directly to a local pharmacy. GPs are able to retrieve the information online, and patients themselves can access their MAiHEALTH™ data via an app.
- **Health Navigator**: the Health Navigator website is designed to link consumers and health professionals to online resources and websites that provide information to assist people living with long-term health conditions (Honey et al 2010). The stated mission of the Health Navigator Charitable Trust, which owns and runs the website, is: *'To provide New Zealanders with a suite of trusted online health resources that are relevant and support shared decision making between them and their healthcare providers, and to increase their confidence, skills, independence and wellbeing'* (Health Navigator Charitable Trust 2018). The site provides access to a wide range of health-related data including information on specific health conditions, tips for healthy living, app and video libraries, and services and support available by region.
- **Swiftmed**: A Christchurch-based fee-for-service general practice video consultation and prescription service. The service directly links a practicing GP with patients anywhere in New Zealand.[5] Prescriptions can also be sent to a pharmacist or patients can have medication couriered directly to their home.

Other examples of virtual health initiatives within New Zealand include a range of mobile health (mHealth) interventions such as Mokopuna Ora (an app based programme providing information to pregnant women and their families) and TextMATCH (a culturally tailored text message-based maternal health programme) (Conectus 2018, Dobson et al 2017).

---

[4] At the time of writing, additional MAiHEALTH™ clinics had also been established in Kaitaia and Tauranga.

[5] See for example https://www.stuff.co.nz/national/health/100766254/online-doctor-business-launch-an-uphill-battle--is-nz-behind-on-telehealth

4. Virtual health's strategic context in Waikato DHB

Wellness model of virtual health

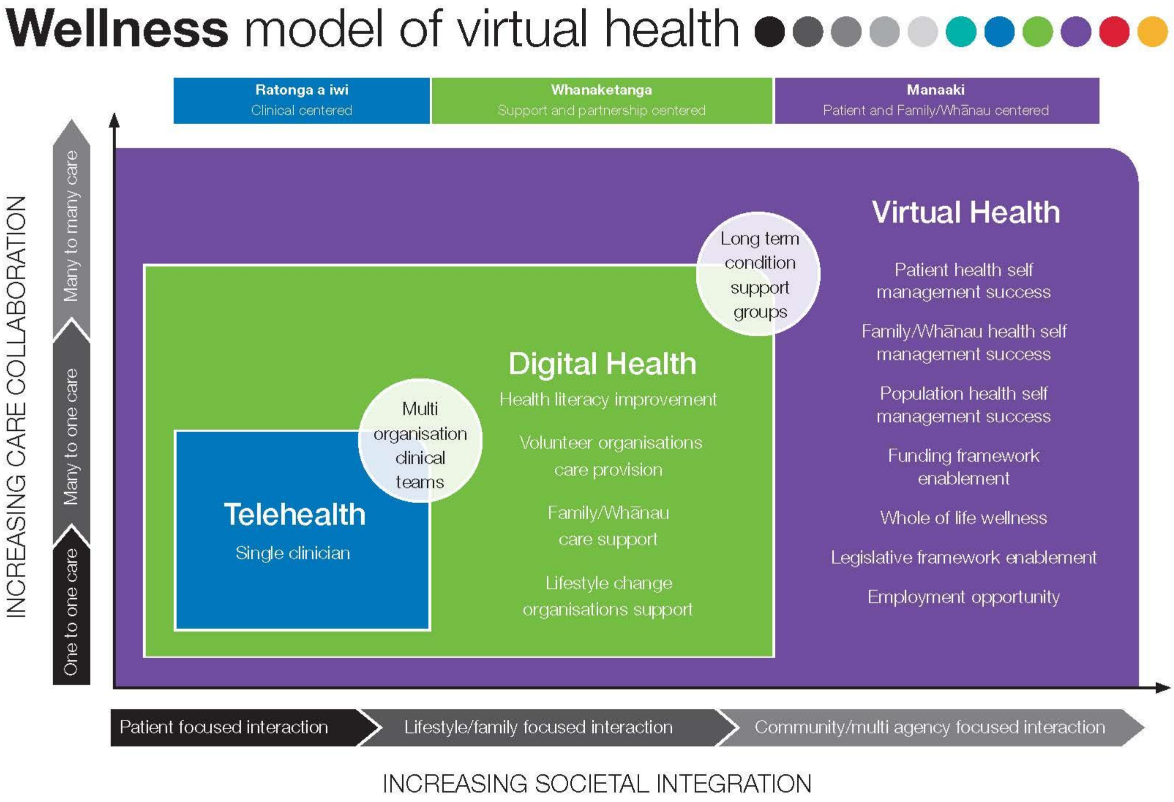
This review was undertaken, in part, to support a Virtual Health strategy that is being developed at Waikato DHB. There are wide-ranging definitions of virtual health; sometimes these are portrayed as a step beyond telehealth and telemedicine, yet equally as often are used interchangeably.

In the strategic context of Waikato DHB, virtual health is proposed as the integration of personal, whānau and societal determinants of health that creates a whole of person wellness. This positions virtual health as a key step beyond traditional approaches to telemedicine. Three stages are proposed in a 'wellness model of health', each building on the next and which steadily support greater consideration of the context of people's lives:

1. **Telehealth**: This is the first wave of e-health approaches, in which the traditional model of health professional and client interactions are simply transposed from a physical face to face setting to an online environment. Telehealth maintains the longstanding relationships between doctors and other health professionals and patients, but interactions are simply mediated through information and communication technologies. This is driven by an **efficiency** paradigm that seeks to drive greater utility from available resources.
2. **Digital health**: This second wave of delivery places a range of apps and other digital tools in the hands of patients to monitor their own health and engage more interactively with health professionals. Digital health enables patients to reach a range of clinicians directly using tools that they themselves control. It provides a process through which patients have more control and can take greater initiative in engaging with health services. This is driven by an **effectiveness** paradigm that seeks greater impact on health outcomes, by linking patients electronically with an array of clinicians to support their care needs.
3. **Virtual health**: This extends the telehealth and digital health approaches to include the use of digital tools to support people improve and maintain healthy lifestyles. This offers an **evolution** paradigm that places patients and their families as partners in care. It also acknowledges the environment of constrained clinical resources and the opportunity to motivate patients and their families to support healthier lifestyles. This stage also acknowledges broader social determinants of health and the opportunity to link people to other service providers (such as education and housing) that can support healthier environments for people.

These three stages are depicted in Figure 1 below. The diagram points to the evolutionary paradigm of virtual health, which supports improved self-management by patients, family and whānau, achieving population health outcomes, and other strategic goals of the DHB and government.

Figure 1: Wellness model of health



It should be noted that much of the evidence base at this third, 'virtual' level, is limited, and more often is situated within telehealth and digital health. As much as possible, this is acknowledged in the discussion that follows.

Waikato DHB population and implications for virtual health approaches

In 2016/17, the population of Waikato DHB was similar to the national average in terms of age profile, but with a higher percentage of Māori (23%) than the national average (16%) and lower percentage of Pacific people (3%) compared to 6% nationally.[6] Within Waikato DHB young people aged under 15 years in the district, 36% are Māori; and among those aged 15-24 years, 30% are Māori, both higher than the national average (26% and 21% respectively).[7]

The DHB also has a higher proportion of populations living in more deprived areas (25% living in the most deprived quintiles) than the national average; indicating that while there are areas of great wealth, there are also areas of substantial poverty in the region.[6] Māori and Pacific people, and people living in areas of higher deprivation, tend to have higher health needs than other ethnic groups and people in wealthier areas.

---

[6] https://www.health.govt.nz/new-zealand-health-system/my-dhb/waikato-dhb/population-waikato-dhb. Accessed 30 January 2017.

[7] Ministry of Health annual population projections for DHB funding calculations (figures supplied directly by Waikato DHB).

The region has proportionally more people living in rural areas than the national average (19% in Waikato compared to 11% nationally (National Health Committee 2010). It is also evident that the DHB covers a substantial rural area (as indicated in Figure 2 on the following page), posing challenges in service delivery and access to health services for remote and dispersed populations.[8]

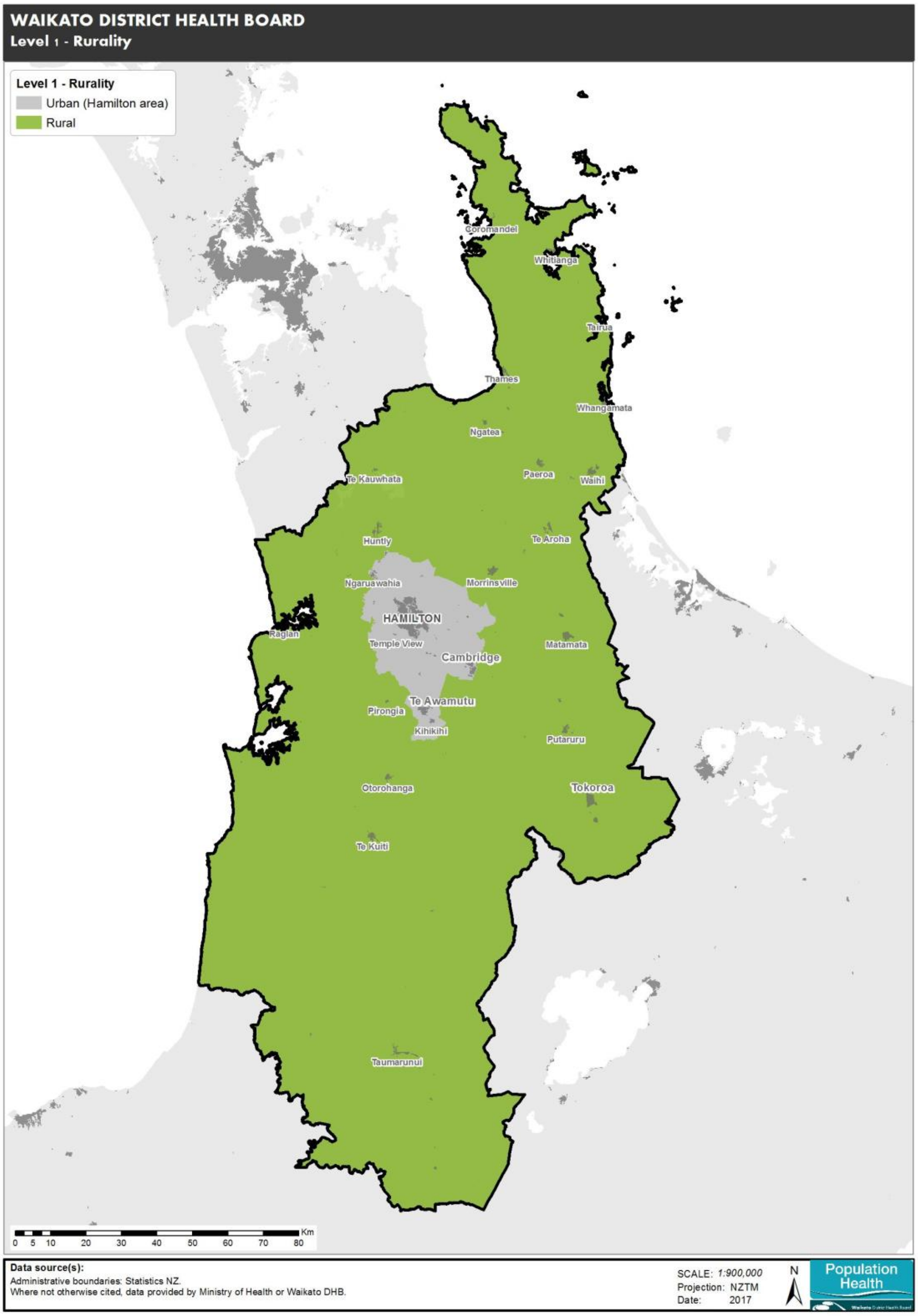
By 2026, the population of Waikato DHB is expected to increase by 19% from 2013 levels, and the number of people aged 65 years and over will have increased by 56%.[7] Over this time, long-term conditions (such as coronary heart disease and diabetes) are estimated to increase by 20%, breast cancer admissions among those aged 45 years and over are expected to increase by 12%, and admissions for mood disorder and schizophrenia are expected to increase by 5%.

In the light of the research explored in this review, these population dynamics pose both opportunities and challenges. Virtual heath approaches could provide new and innovative ways of engaging people with higher health needs and living in remote to access health services and better manage their health, and in so doing provide greater equity of care and reduce health inequalities. However, access to technology is more limited in these groups, and may well require specifically targeted interventions to support uptake, including technological access, well-designed and culturally relevant interfaces, social marketing to promote access, and well-designed coordination across services.

---

[8] https://www.waikatodhb.health.nz/assets/Docs/About-Us/Key-Publications/Plans/Waikato-DHB-Annual-Plan-2016-17.pdf. Accessed 29 March 2018.

Figure 2: Rurality in Waikato DHB



Source: Waikato DHB

5. Opportunities and benefits of a virtual health system

What are the needs, opportunities, and benefits of a virtual health programme in a publicly-funded health system?

This section considers the opportunities afforded by a virtual health system, including the issues that it can address and the potential benefits for health providers, clinicians and patients.

Recent analyses of the challenges facing healthcare systems commonly identify factors such as ageing and rising populations, increased life expectancy, staffing shortages, and the increase in chronic diseases (Broens et al 2007, Cooper & Allen 2017, Jamieson et al 2015). These issues and the subsequent strain on financial resources have contributed to a growing interest – and investment – in technology and virtual health care initiatives as a means of reducing costs, increasing patient access, and improving care (Cooper & Allen 2017). A paper from a virtual health symposium in Canada put forward the value proposition of virtual care as follows (Jamieson et al 2015):

1. *Virtual care creates the preconditions for truly empowered patients and patient-centric care*: Described as the 'healthcare equivalent' of other services that populations access online in their day-to-day lives (e.g. banking and shopping), it provides opportunities to increase patient engagement and empowerment. Overall care may be improved via the promotion of patient self-management, and inequalities in access reduced as a result of geographical boundaries being eliminated.
2. *Virtual care spans the 'silos' of care, virtually eliminating the 'transition'*: It offers a team-based approach to healthcare which minimises risk via task delegation, shared accountability and contingency planning. This may be particularly effective with patients with multiple chronic conditions who pose particular challenges in relation to coordination and continuity of care.
3. *Virtual care reduces redundancy and waste by sharing greater knowledge across the system*: System efficiencies may be gained via the sharing of data. For example, increased access to results, clear care plans, and online communication between different healthcare providers can reduce unnecessary tests or referrals.

Potential benefits for patients

Identified benefits

Potential benefits for patients are wide-ranging, as presented in the list below. It should be noted that many of the advantages of virtual health are linked to specific initiatives, population groups or health conditions, with some showing positive effects in relation to some factors and others not. Further, much of the literature is focused on telehealth or telemedicine rather than the broader conceptualisation of virtual health as presented in the wellness model discussed earlier. Key identified benefits include:

- **Improved access to healthcare and health-related education** (Al-Shorbaji 2013, Bourne et al 2017, Cooper & Allen 2017, Deloitte 2015, Ekeland et al 2010, Hunt et al 2014, Jamieson et al 2015, Jung & Padman 2014, Nelson et al 2017): This is primarily due to a reduction in geographical barriers. Remote ICUs, for example, can improve access to critical care services for patients in isolated areas – and virtual consults can address access barriers for patients living in rural locales. Similarly, mHealth[9] applications can improve access to overall health and wellness education.

- **Increased ownership of, and access to, health information** (Department of Health 2012, Nelson et al 2017, Walker et al 2011): This includes patients being able to more easily access information via mHealth, as well as full access to health-related information via electronic health records. Reported potential benefits include improved self-management of health, identification of errors in records, and the ability to share records with other health and care professionals.
- **Increased patient engagement** (Al-Shorbaji 2013, Deloitte 2015, Hunt et al 2014, Jung & Padman 2014, Price et al 2013): Research has shown that technology can support people to take control and be responsible for their own health and wellbeing, navigate the health system, and engage patients via shared decision-making and real-time access to information.
- **Improved patient satisfaction/experiences** (Deloitte 2015, Ekeland et al 2010, Hunt et al 2014, Jamieson et al 2015, Kitsiou et al 2015, Nelson et al 2017): It has been reported that health service users can feel more confident and empowered as a result of engagement in telehealth initiatives, and may experience improved provider-patient relationships. Further, virtual healthcare may improve the patient experience by providing online access to medical information and support.
- **A reduction in direct and indirect costs** (Deloitte 2016b, Hunt et al 2014, Jamieson et al 2015, Whitten & Love 2005, Zanaboni & Wootton 2012): This includes the elimination of lost wages due to attending in-person visits, as well as associated transport and parking costs. A need to schedule appointments around work and childcare commitments may also be reduced.
- **Improved health outcomes** (Al-Shorbaji 2013, Greenhalgh et al 2017a, Hanlon et al 2017, Hunt et al 2014, Inglis et al 2015, Kitsiou et al 2015): The predictive capabilities of tools such as remote monitoring devices may detect adverse events and reduce readmissions to hospital. In addition, remote ICUs which enable monitoring by specialised care can reduce mortality, and virtual consults with specialists have the potential to reduce complications due to faster treatment. More intensive and multifaceted interventions have been associated with greater improvements in some conditions. Increased patient engagement achieved through initiatives such as mHealth may also indirectly lead to better health outcomes.

Limitations to virtual health

With regard to clinical outcomes, it is important to note that some reviews of telemedicine have not identified positive effects in this area (Ekeland et al 2010, Hanlon et al 2017), with evidence that it is not consistently superior to usual care (Hanlon et al 2017) or may only be considered better when usual care is suboptimal[10] (Greenhalgh et al 2017a) . In addition, an investigation of reviews in this field found that:

---

[9] mHealth involves the use of mobile communications technologies within healthcare, and incorporates the delivery of health information, health services, and healthy lifestyle support programmes (see: https://www.telehealth.org.nz/what-is-telehealth/mhealth/).

[10] However, it is also been identified that it is not associated with worse outcomes and may be a safe alternative mode of delivery for self-management support in relation to some health conditions (e.g. heart failure) (Hanlon, 2017).

- Potential effectiveness could only be attributed to specific initiatives (e.g. telepsychiatry)
- Of the many studies exploring telemedicine a minority actually investigated clinical outcomes
- There were inconclusive results regarding clinical benefits and outcomes
- Telemedicine is often used even if it is not supported by high quality evidence (Ekeland et al 2010).

Potential challenges for virtual health approaches in reaching target populations include patients not wanting to be ‘tracked’ (e.g. via remote monitoring devices), and a lack of interest or engagement in proposed interventions (Greenhalgh et al 2017b). For example, Greenhalgh and colleagues (2017) identified that some patients involved in a remote biomarker monitoring initiative found the experience confusing and did not know – or wish to know – what the figures meant. They also highlight that, while it is commonly argued that remote technology will empower patients and increase efficiencies by encouraging self-management of chronic conditions, others have discussed that this can place additional demands on the unwell and therefore poses ethical questions. Further, these extra responsibilities may be physically or cognitively impossible for some (Greenhalgh et al 2017b).

Other research which assessed the evidence in relation to telehealth interventions to support self-management of long-term conditions found that findings varied between and within disease areas. For example, there were positive effects with regard to type 2 but not type 1 diabetes; and interventions reduced mortality and hospital admissions in heart failure, but findings were inconsistent across reviews (Hanlon et al 2017).

Some caution has also been expressed with regard to interpreting health outcomes in relation to virtual care, and its potential to replace face-to-face interactions between patients and clinicians. For example, the quality of evidence with regard to health outcomes in some telehealth interventions has been described as either low or questionable (Greenhalgh et al 2017a, Kitsiou et al 2015). When considering the value proposition for patients, Greenhalgh et al (2017) argue that there may be a trade-off made between the potential benefits on offer, the costs of the technologies, the effort involved, and the desirability of surveillance and medicalisation.

Akar and Hummel (2016) note that, while one trial of an implantable cardioverter-defibrillator (ICD) remote monitoring device identified a significant mortality reduction amongst the treatment group, there was an increase in both office visits and phone contacts with those who received the device due to alerts triggered by the monitoring. Therefore, some of the reported benefits may be attributed to these increased interactions. They also discuss a telehealth intervention which aimed to reduce heart failure hospitalisation by providing clinical information via a remote device. However, the results in fact indicated a significant increase in admissions to hospital due to patients’ heightened awareness and subsequent seeking of unnecessary assessments, which sometimes lead to hospitalisation (Akar & Hummel 2016).

Benefits for health systems

When considering benefits for health systems, Nelson et al (2017) cite published examples where the introduction of a virtual health programme has provided positive outcomes, most notably a reduction in readmission rates within hospitals, staff turnover, physician visits, and ICU length of stay. In addition, financial benefits identified included a 100 percent return on investment within two months for a programme that introduced multidisciplinary video collaboration and Bluetooth electronic stethoscopes, and savings from a reduction in ICU patients being transported to hospital due to remote monitoring by clinical staff (Nelson et al 2017).

Some of the key benefits for healthcare providers identified as part of this review include:

- **Improved operational efficiencies** (Daim et al 2008, Deloitte 2015, Ekeland et al 2010, Henry et al 2017, Hunt et al 2014, Inglis et al 2015, Jamieson et al 2015, Jung & Padman 2014, Watson 2016): Virtual health initiatives can facilitate improved collaboration and sharing of information across providers (e.g. between primary care clinicians and specialists) resulting in increased diagnostic efficiencies, a more holistic treatment approach, and a reduction in unnecessary patient transfers or additional care. Remote monitoring and diagnostic programmes can also reduce the level of in-person visits due to the provision of summary data on patient vitals, and efficiencies may be introduced via the faster communication of test results and the freeing up of clinicians for more complex face-to-face visits.
- **Increased capacity to deliver healthcare** (Cooper & Allen 2017, Henry et al 2017, Poynter et al 2017, Weissman et al 2017)**:** Given that care can be provided in a range of locations (e.g. a patient’s home, community centres) virtual health programmes can increase providers’ capacity to deliver care to a larger pool of patients. This includes clinicians working with increased numbers of patients and being able to meet the needs of populations across a wider geography.
- **A reduction in costs** (Al-Shorbaji 2013, Daim et al 2008, Deloitte 2015, Hunt et al 2014, Inglis et al 2015, Kitsiou et al 2015, Speyer et al 2018, Weissman et al 2017): Savings may be made across a number of areas. For example, with asynchronous initiatives such as secured messaging, interactions require less infrastructure and can be scheduled during off-peak hours. Economic benefits may also be gained via a reduction in hospital admissions or shorter hospital stays, as well as the decrease in mileage reimbursement for clinicians previously required to travel between clinics.
- **Addressing staff/provider shortages** (Hunt et al 2014, Nelson et al 2017, Weissman et al 2017): Virtual consults or remote ICUs can be beneficial in areas where facilities are spread across a wide geography, and/or there is a shortage of specialist and other healthcare resources (e.g. a lack of GPs in rural locales). In addition, remote home monitoring devices may alleviate physician shortage by reducing unnecessary utilisation of healthcare.
- **Access to an untapped pool of clinical resources** (Hunt et al 2014): Virtual health programmes offer benefits to clinicians who are looking for increased flexibility in their working life (e.g. semi-retired clinicians or those seeking an improved work/life balance). If offered, this may enable healthcare providers to attract and retain a high-quality workforce, improve staff satisfaction, and access highly specialised resources to improve quality of care.

As with benefits for patients, systemic advantages and impacts can vary depending on the nature of the intervention (Nelson et al 2017). Drawing on Nelson et al (2017), Table 1 below provides a summary of benefits according to different virtual health offerings.

Table 1: Virtual health initiative and reported benefits

INITIATIVE	*CARE AREA*	*IMPACT FOR HEALTH PROVIDERS*
Tele-radiology	Radio-diagnosis	• Improved time-to-read and time-to-diagnose across facilities • Lower labour costs (particularly in rural and semi-urban facilities) • Addresses shortage of highly skilled radiologists
Remote monitoring	Population health Transitional care Chronic care	• Can help detect adverse events early/before they occur avoiding hospitalisation costs • Early discharge can result in reduced office visits (lower costs)
mHealth	Operations/multiple areas (scheduling, education, monitoring, compliance)	• Increased patient engagement • Improved ability to detect and track diseases
Remote ICU	Emergency care Intensive care	• Addresses staff shortages via standardised and centralised ICU monitoring
Virtual consults	Specialist consults (e.g. neurology)	• Improved access to specialists • Reduces cost of resources • Addresses shortage of some specialities
Virtual visits	Chronic care Primary care visits Transitional care	• Increased provider productivity • Enables early discharge from inpatient facilities • Increased frequency of monitoring of chronic conditions
Tele-pharmacy	Prescriptions Dispensing	• Addresses shortage of pharmacists in remote areas • Improved productivity and lowered costs (due to reduced need for on-site pharmacists during off-peak hours)
Medication compliance management	Drug adherence Follow-up care Chronic care	• Improved patient adherence to medication regimen • Increased patient engagement in chronic care

Other benefits

While it is beyond the scope of this review to explore in detail the wider societal benefits of a virtual health programme, it is worth highlighting in brief some of the positive intersectoral outcomes that may be realised as a result of improved health across the population. This includes the potential for:

- Economic benefits derived from a healthy and productive population, through improved healthcare access (Cooper & Allen 2017).
- Empowering community members as lay health workers (Henry et al 2017).

- Improvement in child educational outcomes through meeting their health needs more rapidly (World Health Organization 1998).
- Accessing specialist assessments and advice for people with mental health needs in isolated rural areas (Hoeft et al 2018) .
- Cost-effective and timely assessment and medical management of the health of people in custody (Young & Badowski 2017).

Virtual health and health inequalities

The potential for virtual healthcare to bridge the care gap for populations living in remote areas is widely discussed in the literature (Bourne et al 2017, Bradford et al 2016, Deloitte 2015, Kitsiou et al 2015, Poynter et al 2017, Zanaboni & Wootton 2012). This includes individuals and families living in rural locales, patients in developing countries with limited access to healthcare, and the ability to connect health providers with patients from anywhere in the world (Deloitte 2015, Deloitte 2016b). Given that a lack of access to GPs and other health services in remote areas results in large numbers of preventable hospitalisations each year, and that rural populations may suffer poorer health outcomes overall, this model of healthcare delivery has the capacity to provide access to a more equitable standardisation of care (Bourne et al 2017, Speyer et al 2018).

Virtual healthcare also has scope to target services to priority populations, including indigenous and other marginalised groups (Henry et al 2017, Poynter et al 2017). For example, Jamieson et al (2015) highlight that multimorbid patients with multiple chronic diseases, new immigrants, and mental health consumers present the most potential to be impacted by virtual healthcare. They argue that it is especially significant for mental health and addictions patients, who have been identified as high users of such systems in Canada. This is attributed, in part, to the elimination of geographical barriers, the redistribution of psychiatry support and a reduction in the barriers to follow-up care (Jamieson et al 2015).

It is important to note, however, that whilst the more marginalised or vulnerable patients have the potential to benefit from virtual health services, there are often a range of barriers to their uptake. Older patients, for example, are slower adopters of online health consultations, and the predominant users of online health consultations are younger, more educated and have higher household incomes than non-users (Jung & Padman 2014). Further, those who have been identified as potentially benefitting the most from virtual care may be the least likely to be able to pay for such services, thus limiting their access (Jamieson et al 2015, Wade et al 2016). Greenhalgh et al (2017) also draw attention to the link between chronic health conditions and social determinants[11], and note that these individuals are likely to have less reliable access to broadband, have lower levels of digital literacy, and experience housing and debt-related problems.

In addressing these barriers, it is worth highlighting some of the strategies taken by virtual health providers in New Zealand. The iMOKO and the MaiHealth services, for example, are provided to patients at no cost (Henry et al 2017). Given the levels of deprivation faced by many families living in the targeted areas, this can therefore increase healthcare access for children and families who may otherwise face significant barriers in having their health needs met (Poynter et al 2017). The

---

[11] For example, Type 2 diabetes and heart failure are more than twice as common within the most economically deprived and least well-educated population groups (Greenhalgh et al, 2017).

importance of low-cost broadband to ensure that low-income families are able to access these services has also been highlighted (Dale 2017), alongside the advantages of this model of healthcare being developed and delivered from within the community, rather than being applied by an outside authority (Henry et al 2017).

While not specifically linked to virtual healthcare, a health navigator model of care may facilitate access and support for more vulnerable patients facing multiple barriers in negotiating health pathways (Doolan-Noble et al 2013), and others have argued that clinicians play an important role in encouraging patients to utilise virtual health offerings (Jung & Padman 2014). Others have highlighted that virtual health offerings should not be the only option available, and delivered in combination with other traditional healthcare services, such as face-to-face consultations (Accenture Consulting 2015, Bourne et al 2017). Further, Wade et al (2016) recommend that health services need to incur the costs of devices and broadband connectivity for low-income families if the benefits of home telehealth are to be realised.

Jamieson et al (2015) posit that all patients, regardless of educational attainment, socio-economic status or other factors, should have access to ‘empowering technologies’. They further argue that this is particularly important given that the most disadvantaged patients are often the costliest within the healthcare system. As such, they propose that all virtual care solutions should be assessed against the following three guiding questions (p. 18):

1. To what extent does this solution directly impact real patient outcomes or patient/provider decisions about a patient’s health? *The patient should always be at the centre*.
2. To what extent does the solution represent a patient’s entire journey across the continuum of care? *Think outside the silo before you think within it.*
3. To what extent does this solution benefit the small percentage of patients in our system who generate dramatically out of proportion systemic costs? *The complex is a rule, not an exception.*

6. Technology adoption in healthcare

What evidence-based approaches support and achieve changes in clinical practice, and what are the implications for virtual health systems?

The challenge of technology adoption

While there has been a high level of interest in the utilisation of technology in healthcare, and expectations of significant growth in this area, its implementation has not been without problems, and many of the predictions for its uptake have not been fully realised (Standing et al 2016, Zanaboni & Wootton 2012). For example, many telehealth services which start out as pilot or small scale projects are rarely sustained (Greenhalgh et al 2017b, Standing et al 2016, Wade et al 2014) and telehealth is still not considered a mainstream health sector activity (Standing et al 2016). Of note, it has been estimated that up to 80 percent of technology projects introduced in the healthcare setting fail (Greenhalgh 2017, Greenhalgh 2018).

It is only in the last ten to 15 years that the reasons behind this high rate of failure have begun to emerge (Greenhalgh 2017). Some of the reported reasons include non-adoption by intended users (Greenhalgh et al 2017b), the risk adverse nature of the health sector (Standing et al 2016), and the challenge of introducing technology into complex organisational systems (Cresswell & Sheikh 2013, Darkins 2014).

This lack of progress is perhaps not surprising, given the complex processes of change required at both the organisational and individual (i.e. practitioner) levels (Mair et al 2012). It has also been argued that the introduction of new technologies is a social process which may be open to different interpretations (Greenhalgh et al 2017b). Other challenges include the evolutionary nature of new technologies (Greenhalgh et al 2017b, Obstfelder et al 2007) and the broader impact of technology on the concept of what it means to 'care' within the clinical setting (Swinglehurst et al 2012). Previous research has identified that problems are more likely to be experienced if a project is extended beyond a single organisation (Greenhalgh 2018) or if technology is introduced in larger, more complex settings (Cresswell & Sheikh 2013).

It should also be noted that the challenges of technology adoption in healthcare occur within a context of well-established time lags for research evidence to inform clinical practice, which are estimated to average some 17 years (Morris et al 2011).

Theoretical frameworks for technology adoption

This rapid review identified a range of theoretical frameworks and models that conceptualise the relationship between the users of technology, the organisations in which they are implemented, and the technology itself. These can help to elucidate possible responses by clinicians to new technological systems with the workplace, alongside the drivers and barriers for subsequent adoption.

It is beyond the scope of this review to outline in detail current theoretical approaches; however, a summary of some of the key models is presented in Table 2 below. This is drawn from Cresswell and Sheikh's (2013) interpretive review, in which they highlight that 'there is no overarching conceptual framework in relation to the implementation and adoption of HIT[12] innovations' (p. e74).

Table 2: Examples of theoretical approaches conceptualising the interaction between technology, humans and organisations (Cresswell and Sheikh, 2013)

Diffusion of innovations: These approaches focus on how innovations spread in, and across, organizations over time

Normalisation process theory: This theory describes how complex interventions in healthcare are routinely incorporated into the day-to-day work of healthcare staff. This model highlights the importance of social processes and the organizational context in shaping outcomes.

Sense-making: This approach assumes that individuals in organisations discover meanings of the status quo often by transforming situations into words, and then displaying a resulting action as a consequence of their interpretations. This assumes that the way in which organisations are talked about defines their existence

Social shaping of technology: This theory highlights the importance of wider macro-environmental factors, and focusses on the social consequences of technology implementation, including the fact that it is shaped by social processes.

Sociotechnical changing: These approaches conceptualise change as a non-linear, unpredictable and context dependent process. Both social and technical dimensions are seen to shape each other over time within an evolving environment.

Technology acceptance model (TAM): This is one of the most widely used theories to study how users are motivated to adopt and use technology **(Fiato 2012)**. The underlying premise is that individual adoption/usage of a system is determined by the potential user's attitude towards use, and perceived usefulness and ease of use of the application.

The notion of 'fit': These models emphasise both the social, technological and work process factors in isolation, alongside the extent to which they align with each other. The better the fit, the higher the level of adoption amongst users is likely to be.

Wade and colleagues (2017) undertook a review of theoretical frameworks applicable to telemedicine research, which identified both 'single theories' (e.g. the TAM) as well as 'categories of theories' (e.g. organisational change management and socio technical theories). They note some limitations of existing frameworks. For example, the TAM is based on the premise that clinicians will use telemedicine only if the technology is easy to use and has high utility. However, subsequent research

---

[12] Health information technology

has identified that clinicians can continue to use technology despite it being problematic, in cases where they receive organisational support and gain experience with the system (Wade et al 2017). Others have highlighted that the TAM, as with other individualistic theories, has a greater focus on early adoption of a technology or innovation rather than subsequent routine use (Robert et al 2010, Wade et al 2014). Further, such an individualist approach has been challenged by more recent literature that looks at technology adoption and adaption in the context of broader organisational and professional systems and cultures, an example of which is provided below.

The Nonadoption, Abandonment, Scale-up, Spread, and Sustainability (NASSS) Framework

A recently developed framework by Greenhalgh and colleagues (2017) seeks to predict and evaluate the success of new technologies introduced in the health and social care setting. This draws on a review of the existing literature and empirical case studies of technology implementation. The NASSS framework consists of 13 questions in six domains: the condition, the technology, the value proposition, the adopter system (staff, patient, and lay caregiver), the health or care organisation, and the wider context (institutional and societal). An additional domain incorporates changes over time.

The main domain relevant to this review, **the adopter system** asks: *'what changes in staff roles, practices, and identities are implied?'* For *simple* interventions (defined as straightforward, predictable, few components), there are none; for *complicated* (defined as multiple interacting components or issues), it is argued that clinicians are required to learn new skills and/or new staff will be appointed; and, for *complex* (defined as dynamic, unpredictable, not easily disaggregated into constituent components), there is a threat to professional identity, values, or practice, including a risk of job loss. In addition, the **health or care organisation** domain considers the extent to which established work routines will be disrupted with, for example, *complex* interventions likely to introduce new routines which conflict with existing ones. Given that virtual health operates within the *complex* space, these issues highlight the potentially significant threat that this emerging model poses to clinicians.

Emerging feedback on this framework has identified that it has proven useful in helping healthcare providers consider challenges in the implementation of technology programmes, particularly at an early stage to inform technology and service design. It may also be used to address micro-level challenges of individual adoption (Greenhalgh et al 2017b).

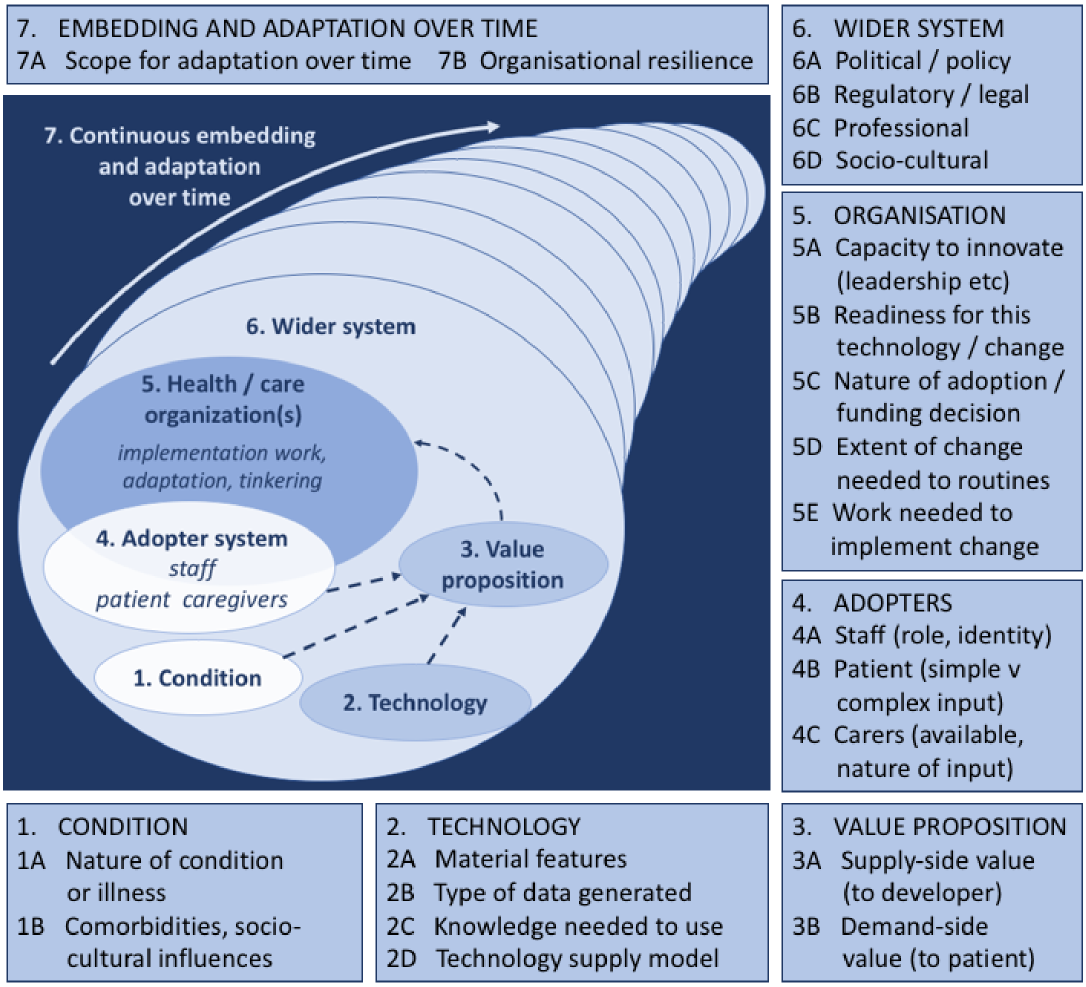


Figure 3: Nonadoption, abandonment, scale-up, spread, and sustainability (NASSS) framework (Greenhalgh et al 2017)

Sociotechnical design

Sociotechnical design, defined as: '*the development and adaptation of work processes alongside the development, introduction and customisation of technology*' (p. 150) (Greenhalgh, 2018) is another area for consideration with regard to the introduction of technological innovations within healthcare settings. Table 3 below outlines 10 principles of sociotechnical design, as developed by Greenhalgh (2018)[13]. She argues that the most important is the first – that the introduction of technologies in an organisation is a social process in which *'values, mindsets and engagement'* are crucial. In addition, it is not '*technical and rational*' but rather creative and social, involving collaboration, listening, and trial and error.

---

[13] This is adapted from the work of Albert Cherns and Chris Clegg (Greenhalgh, 2018).

Table 3: Principles of sociotechnical design (Greenhalgh, 2018)

Meta-principles

1. Sociotechnical design is a social process in which values, mindsets and engagement are critical.
2. Design should reflect the needs of patients, staff and the service as a whole.

Content principles

3. Design entails multiple task allocations between and amongst humans and technologies.
4. No more should be specified than is absolutely essential, and what is essential should be made explicit.
5. Core processes should be integrated.
6. As far as possible, problems should be dealt with at source (e.g. feed local data back to local teams in a timely way).

Process principles

7. People should be involved in designing the jobs they are to perform.
8. Resources and support are required for design.
9. Evaluation and group learning are integral to the design process.
10. System design involves political processes; attention needs to be paid to power dynamics.

The role of clinicians in virtual health

> *As the history of telemedicine so clearly shows, governments can provide the technology for telemedicine, but unless health professionals are persuaded, the equipment will not be used.* (p. 6) (Zanaboni & Wootton 2012)

As one of the key players in the implementation and delivery of virtual health, clinicians play a fundamental role in the success of such interventions (Brewster et al 2014, Greenhalgh et al 2017b, Jamieson et al 2015, Standing et al 2016, Wade et al 2014, Zanaboni & Wootton 2012). For example, frontline staff's 'scepticism' has been identified as one of the key potential barriers[14] to their implementation (Brewster et al 2014), while clinician acceptance has been identified as the most important factor for sustainable telehealth services (Wade et al 2014). Based on the findings of their review of previous technology implementation frameworks, Greenhalgh and colleagues (2017) suggest that:

> *Acceptance by professional staff may be the single most important determinant of whether a new technology-supported service succeeds or fails at a local level* (p. 8).

Virtual health models of care may offer a number of advantages to clinicians. This includes the potential to combat low morale within the workforce by addressing staff shortages and burnout (Cooper & Allen 2017). Clinicians may also gain increased job satisfaction due to the improved quality of care provided to patients (e.g. via technological advances in diagnostic capabilities) (Cooper & Allen 2017, Zanaboni & Wootton 2012) and a decreased need to travel (Weissman et al 2017, Whitten & Love 2005). One review of the evidence in this area found that medical professionals utilising

---

[14] Other potential barriers include technology, strategic planning, and funding (Brewster et al, 2014).

electronic medical records appreciated the ability to provide expert advice on a more flexible timetable (Whitten & Love 2005).

The ability to focus on core clinical responsibilities has been highlighted as a key advantage (Cooper & Allen 2017, NZ Telehealth Forum and Resource Centre 2018). This is due to the reduced time spent on routine administrative tasks or travelling for consultations. The use of remote monitoring devices, whereby patient information is transmitted prior to a clinical appointment, may also streamline face-to-face consultations given that clinicians can consider treatment options prior to the in-person meeting (Accenture Consulting 2015). Similarly, being able to review patients' information electronically can facilitate specialists' decisions about the need for face-to-face visits and reduce unnecessary referrals (Whitten & Love 2005).

Other potential benefits for clinicians include the prevention of physical injuries due to robotic support for lifting patients, and increased flexibility and control over shift work management as a result of app-based scheduling software (Cooper & Allen 2017). A virtual model of healthcare can also facilitate closer working relationships between different health professionals, and increase knowledge amongst some clinicians due to increased exposure to specialist consultations (NZ Telehealth Forum and Resource Centre 2018, Watson 2016, Whitten & Love 2005).

Facilitating clinician uptake of new technology and virtual service delivery models

It has been reported that there is limited evidence of 'what works' with regard to the adoption of new technologies in healthcare by clinicians, particularly in relation to telehealth/telemedicine (Gagnon et al 2009, Wade et al 2014). In their systematic review of the implementation of e-health systems, for example, Mair and colleagues report a lack of coverage of the factors that promote or inhibit user engagement and participation (Mair et al 2012). However, there have been a number of reviews of the emerging evidence to date, and these data form the basis of findings presented in this section.

In writing about the introduction of technology in healthcare, Greenhalgh (2018) presents lessons learned from evaluating a national IT programme in the UK. Whilst not all are linked directly to clinicians or clinical practice, they emphasise the complexity of technology adoption in healthcare, including the diverse range of stakeholders involved. Greenhalgh proposes six 'worlds': the political, clinical, personal (patient/carer), technical, commercial, and legal/regulatory, each with different views and needs (these are detailed further in the box below). For example, while the commercial focus might conceptualise technology as a means for delivering return on investment, the clinical view is more concerned with how it can support professional practice; thus, tensions and paradoxes are inherent. She emphasises that successful implementation is very dependent on frontline staff. Other reported learnings include that when introducing new technology, organisations must seek a balance between 'hard' (e.g. goals) and 'soft' approaches (e.g. debate and dialogue). (Greenhalgh 2018).

Table 4: Greenhalgh et al's 'six worlds' (Greenhalgh, Stramer et al. 2010, Greenhalgh 2018)

Greenhalgh et al's 'six worlds' explores the way in which technology is conceptualised and experienced by different stakeholders. Differences in 'norms, values, priorities, expectations, and ways of working' between these different worlds account for many of the challenges and tensions that can arise as healthcare providers look to implement new technology within a complex system

Political: Technology is a vehicle for delivering policy and concerned with improving efficiency and providing measurable benefits to patients

Clinical: Technology is a tool to support professional practice and improve quality of care

Personal (patient/carer): Technology advances into the individual's personal world ('my data, my record')

Technical: The focus is on design and as a software development project.

Commercial: Technology is a way of delivering return on investment.

Legal/regulatory: Technology poses challenges with regard to information governance.

Similarly, a systematic review of clinical staff's acceptance of telehealth for the management of Chronic Obstructive Pulmonary Disease and Chronic Heart Failure identified a range of facilitators (Brewster et al 2014). Having easy-to-use reliable equipment was important, alongside collaborative involvement in service design, and training and support for staff. For example, at least one initiative identified had involved both staff and patients in service design, which incorporated the creation of a community of practice, and resulted in clinician acceptance of the new technology. The introduction of clinical 'champions' who took a lead role was identified as a successful approach, as was staff training.

Enablers of clinician engagement

This review identified a number of potential strategies for supporting and achieving changes in clinical practice as it relates to the introduction of technology and, where possible, virtual health systems. These include a mix of solutions aimed at the individual, technological and organisational levels, as follows:

- Organisational context
- Clinical champions
- Clinician involvement in design, selection and implementation of new technology
- Equipment and technology
- Training
- Social networks.

A summary of each is provided in the sections that follow.

Organisational context

The structural and contextual characteristics of an organisation have a role to play in the adoption of new technologies by clinicians, particularly given that the introduction of these are likely to be disruptive to the work environment (Gagnon et al 2009, Jarvis-Selinger et al 2008, Jennett et al 2003, Walker & Whetton 2002, Zanaboni & Wootton 2012). Brewster et al (2014) suggest that prioritising infrastructure first should be the priority – rather than, for example, purchasing equipment and then attempting to change practice.

This issue is considered in the literature across a number of domains, including organisational culture, level and nature of management support, and the placement of strategic importance on technology by the organisation (Jennett et al 2003, Menachemi et al 2004, Walker & Whetton 2002). Jennett and colleagues (2003) discuss it in relation to 'organisational readiness' which incorporates organisational culture that is receptive to change, a shared vision of the aims of telemedicine, and the implementation of change management plans by senior leadership. Others have emphasised the importance of change management strategies to ensure limited disruption to workflow and to facilitate a positive reception from stakeholders (Jarvis-Selinger et al 2008). Change management approaches in healthcare are discussed further in section 8.

Strong leadership from healthcare providers is vital (Cresswell & Sheikh 2013, Daim et al 2008, Morton 2008). This includes demonstrating support for, and commitment to, the implementation process – as well as clear communication of the benefits of proposed systems between leaders and clinical staff (Daim et al 2008). Of note, senior leadership can play an important role in influencing how clinicians adapt to new technology. For example, Cresswell and Sheikh (2012) argue that:

> *These champions frequently need to act as 'boundary spanners', bridging the gulfs that often exist between and within information technology staff, management and clinicians. They can also facilitate the re-design of workflows, provide adequate training and support to users, and highlight problematic issues.* (p. e81)

They provide further detail of the role that these individuals can play, including proactively reducing clinician workloads during the period of implementation and/or introducing the new technology at a time when there are no major competing interests in the organisation. This will ensure that additional time is available to staff to enable them to make sense of new workflows or ways of working. Management also need to communicate likely benefits and trade-offs to staff, including anticipated time frames (Cresswell & Sheikh 2013).

Clinical champions

Clinical champions may be defined as *'enthusiastic individuals who initiate and promote the uptake of telehealth services* (p. 490) (Wade & Eliott 2012). The influence of these individuals in facilitating staff acceptance of new healthcare technology has been widely discussed in the literature (Greenhalgh et al 2017b, Hendy & Barlow 2012, Jarvis-Selinger et al 2008, Mair et al 2012, Wade & Eliott 2012, Wade et al 2014). In a review of Australian telehealth services, it was identified that most started as small scale projects which were initiated by champions. Further, clinical champions played a key role in the subsequent development of these into sustained services (Wade et al 2014).

The role of champions in influencing their peers may vary. It includes promoting interventions (Jarvis-Selinger et al 2008, Mair et al 2012), motivating their colleagues (Hendy & Barlow 2012), or 'persuading' them that proposed technologies/services are safe, effective, and professionally appropriate (Greenhalgh et al 2017b). Champions can provide legitimation by promoting a set of beliefs about technology or telehealth to clinicians that can enhance their acceptance (Wade et al 2014). This may involve for example, demonstrating the effectiveness of telehealth via the dissemination of research highlighting clinical outcomes (Wade et al 2014) or monthly clinical champion meetings to share telehealth innovations (Darkins 2014). Their potential to build relationships between providers and bring clinicians together has also been identified (Wade & Eliott 2012).

It is important to acknowledge that while clinical champions have a role to play, some limitations have been identified (Brewster et al 2014, Hendy & Barlow 2012). For example, Hendy and Barlow (2012) note that while they are highly effective in the initial phase of adoption of a health system change, they may resist moves to extend the work within the organisation and thus prevent the spread of innovation. Wade and Elliot (2012) also argue that their role may need to adapt, given the risk of continued reliance on champions (e.g. they may move on to different jobs). Other recommendations include that they are identified early (Jarvis-Selinger et al 2008) and partnered over time (Greenhalgh et al 2017b).

Clinician involvement in design, selection, and implementation of technology

It has been reported that clinicians are often overlooked in the development phase of IT systems resulting in resistance and/or lack of uptake of new technologies (Daim et al 2008). This is despite evidence that the involvement of staff in service design – i.e. before interventions are rolled out – can facilitate acceptance of new virtual services (Brewster et al 2014, Cresswell & Sheikh 2013, Daim et al 2008, Greenhalgh et al 2017a). As noted by Greenhalgh (2018):

> *The best people to design the new activities and workflows are the people who live and breathe the existing ones.* (p.149)

A review of successfully implemented telemedical applications identified that one of the criteria for success was collaboration between promotors and users (Obstfelder et al 2007). This included close dialogue during the trial phase between the developers of the technology and its users. The authors note that this could be undertaken either informally amongst key stakeholders, or as part of more formal processes (e.g. local project planning and implementation groups) (Obstfelder et al 2007).

As noted above, involvement in this process may take a number of guises. This includes involving frontline workers in the redesign of work routines at an early stage of development (Greenhalgh et al 2017a), or their active involvement in IT planning (Behkami & Daim 2016, Menachemi et al 2004), including the selection and implementation processes (Fiato 2012, Morton 2008). At a broader level, it should entail open communication and dialogue during the planning phase, ensuring clinician input into the decision-making process whilst also allowing people to voice concerns (Daim et al 2008, Greenhalgh 2018, Jennett et al 2003). Section 8 discusses human-centred design as a key approach in service and technology development in healthcare, which can work alongside broader change management approaches.

Equipment and technology

A systematic review of frontline staff acceptance of telehealth initiatives identified that the reliability and accuracy of equipment is very important (Brewster et al 2014, Jarvis-Selinger et al 2008). For example, if staff do not trust it to effectively monitor patient symptoms, they will not see it as an improvement to existing service provision (Brewster et al 2014). Jennett and colleagues (2003) also argue that if equipment is too 'sophisticated' for its users, it will either be used badly, or not at all. Further, if it is seen to interfere with clinician 'values, aspirations, and roles' it is unlikely to become part of day-to-day practice (Cresswell & Sheikh 2013).

Based on their review of health information technology innovations, Cresswell and Sheikh (2013) report that if clinicians are to engage with new technology, it needs to be seen as useful, offer advantages over current practices, and be at least as fast as existing systems. In addition, it needs to demonstrate benefits early in the process, be easy to use, operate in tandem with existing technology, and have the capacity to be trialled (Cresswell & Sheikh 2013).,

The literature indicates that there should be scope for clinicians to use new technology and equipment creatively (Jennett et al 2003, Swinglehurst et al 2012) which may result in more efficient and patient-centred ways of working (Cresswell & Sheikh 2013, Swinglehurst et al 2012). It involves, for example, staff input into redesigning interventions and customising technologies to increase their usability in practice (Greenhalgh 2018). Given the dynamic nature of healthcare service provision, it is also important that technology is able to be adapted or customised to meet changing needs and contexts of use (Cresswell & Sheikh 2013).

Other equipment-related issues include that it is safe and located in convenient locations (Jennett et al 2003). There is a need for technical support staff to address any issues that arise during clinical consultations, in order to minimise clinicians' troubleshooting role (Jarvis-Selinger et al 2008). The use of dedicated IT staff, in particular, can mitigate potential problems (e.g. telehealth being a low priority within general IT services) (Wade et al 2016).

Despite the strong evidence supporting the importance of easy to use and reliable equipment, it is important to note that research has identified that technological difficulties of a telehealth service may be tolerated by clinicians, provided they are broadly supportive of the method of delivery (i.e. accept telehealth overall) (Wade et al 2014).

Training

Previous research has identified that staff training is a key influence in determining whether or not new technologies are adopted by clinicians, and will shape their potential integration into clinical practices (Edirippulige & Armfield 2017, Gagnon et al 2009). It can play a key role in addressing staff concerns (Brewster et al 2014) and fostering positive attitudes (Jennett et al 2003, Ochieng & Hosoi 2005) towards proposed new technologies. It is also important given that physicians who are familiar with technology are more likely to engage in virtual interventions (Standing et al 2016).

A review of the literature relating to videoconferencing for telehealth, for example, identified that provision of training was integral to clinicians utilising the technology – and that providing this early on in the process was important to ensure that potential users have initial successful experiences. Training that was context-specific (i.e. reflective of the needs of the community) was also essential (Jarvis-Selinger et al 2008).

Training formats may vary, and include orientation sessions, procedural manuals and written instructions as well as ongoing professional development (Jennett et al 2003). However, despite education and training having been identified as important, there is limited evidence regarding both the nature of training required or delivery formats (Brewster et al 2014, Edirippulige & Armfield 2017). Some studies, however, indicate that training interventions should be persuasive, relevant to the audience, and informative (Gagnon et al 2009).

Social networks

Whilst this review did not identify widespread evidence related to the role of social networks, it is suggested that they have a role to play in both organisational change and technology acceptance (Fiato 2012, Wade et al 2016). For example, peer networks and relationships may advance the use of new technology and help users develop the skills and knowledge required to utilise new systems (Fiato 2012, Jasperson et al 2005).

The development of communities of practice or interest has been proposed as a way of bringing providers/clinicians together to solve problems, share expertise, and engage the wider clinical community (Darkins 2014, Wade et al 2016). Communities of practice, espoused by Wenger, are proposed as the basic building blocks of a social learning system; they create learning partnerships among people to learn from and with each other in a particular domain, and can join forces to make sense of and address challenges collectively (Wenger 1998, Wenger et al 2011). They may range from simple discussion groups through to forums that share resources or infrastructure (Wade et al 2016). One example is in developing extensive telehealth services within Veteran Health Affairs in the United States, where work was undertaken to develop a telehealth community. This included meetings to establish communities of interest, which also provided a networking forum for clinicians, managers, and technology staff (Darkins 2014).

Other facilitators of clinician engagement

In their investigation of the reasons for telemedicine having stalled, Zanaboni and Wootton (2012) argue that **personal incentives** for clinicians are required to encourage their adoption of new technologies. The provision of incentives is seen to offer an advantage to the user and an acknowledgement that the use of telemedicine is likely to require additional effort compared to traditional ways of working. They suggest that both financial (e.g. fee-for-service) and professional (e.g. public recognition) incentives are appropriate (Zanaboni & Wootton 2012). Other examples of financial incentives include payments to physicians to use electronic health records and e-prescribing systems (Nixon 2009).

Whilst acknowledged as being very difficult[15], **the regulation and formal approval of medical apps** has been identified as a means of addressing clinician concerns regarding quality control and potential conflicts of interest with developers (Greenhalgh 2018).

Barriers to clinician engagement

A systematic review of telehealth in heart failure identified a range of ‘staff factors’ that contributed to the poor uptake of new technology in the field (Greenhalgh et al 2017a). Of all the barriers to success identified, clinician resistance was highlighted as particularly significant, and incorporated a range of factors. These included a dislike of new clinical routines or interactions (e.g. a preference for face-to-face encounters) and a belief that relationships and therapeutic interactions would be compromised. In addition, staff perceived that their clinical expertise was being marginalised and/or that there was no value for them in the new way of working. Some also struggled to use the technology, which included an inability to remember passwords (Greenhalgh et al 2017a). Another review identified that frontline staff may resist telehealth interventions due to concerns about the technology (e.g. a lack of trust), low expectations of the outcomes of monitoring, and its potential negative impact on staff-patient relationships. Concerns about safety and reliability/accuracy were also evident (Brewster et al 2014).

---

[15] This is due to practical, technological, and legal considerations (Greenhalgh, 2018)

It has been claimed that clinician resistance to technology is related to four elements: 1) the policy reflected in the technology; 2) the sociomaterial constraints of the new technology (e.g. 'clunkiness'); 3) compromised professional practice; and, 4) compromised professional relationships (e.g. remote interactions seen as less professional than face-to-face)(Greenhalgh et al 2014b). In their systematic review, Elwyn and colleagues (2013) attribute the lack of uptake of tools designed to involve patients in clinical decisions to 'clinical inertia'; this is linked to clinicians' lack of confidence in the content of interventions and concern about the impact on established workflows (Elwyn et al 2013).

Despite widespread recognition of the clinician's role in the success of virtual health interventions, one systematic review (Brewster et al 2014) identified that *'recommendations have not moved beyond barrier identification to recognising solutions that might be implemented by front-line staff. Such solutions are imperative if future roll-out of telehealth technologies is to be successfully achieved.* (p.21). Others have noted that a focus on 'people issues' should be prioritised, given that many of the barriers identified are concerned with attitudes, decision-making and behaviour, rather than the technology itself (Standing et al 2016).

Greenhalgh (2018) cautions against reliance on the limitations of randomised trials when exploring the uptake and impact of technologies within healthcare. She argues that more ethnographic research should be undertaken in this field, particularly in understanding how an innovation can be successfully implemented and the impact it may have, rather than simplistically attributing causation or otherwise (Greenhalgh 2018). Of note, she states that:

> *In my view, if we are to illuminate why such a high proportion of technology projects fail in healthcare (and reduce that proportion), we need fewer randomised trials of technologies and more in-depth qualitative research in the real world* (p. 153).

It is important to note that while clinicians may express a range of barriers to adopting new technology within their work practices, the literature suggests that stated reasons may mask the actual causes for a lack of engagement (Greenhalgh 2018). Greenhalgh (2018) highlights, for example, the introduction of electronic medical records which has resulted in a potential for increased surveillance of staff by managers. While clinicians may claim that they have concerns about patient confidentiality, their actual motives for resisting the technology may be linked to the change in power dynamics. Consequently, Greenhalgh (2018) claims that:

> *Because of the political undercurrents, approaches to overcoming resistance need to be directed at their underlying causes, not at the excuses people give when asked.* (p. 150)

It follows, she argues, that solutions must be tailored to the nature of the resistance. If, for example, it is linked to 'people', addressing the problem will involve education, incentives and 'hands on' participation sessions. However, if its basis is within the political sphere, then solutions are likely to be more complex, and may involve strategies linked to organisational work-flows and power dynamics (Greenhalgh 2018).

7. Enabling patient-centred care

What does it mean to be patient-centred and what are the changes that are needed?

This section considers the characteristics of patient-centred care, including how it is defined, what it looks like in practice, and associated benefits.

Defining patient-centred care

As a concept, patient-centred care has been in existence for some time (Kitson et al 2013), and there is growing recognition and acceptance of the need to adopt this approach within the delivery of healthcare (Kitson et al 2013, Robinson et al 2008). However, it has been argued that patient-centred care has not been clearly defined (Gillespie et al 2004, Lewin et al 2001, Mead & Bower 2000, Mead & Bower 2002), and that there is a lack of agreement with regard to *how* it is actually delivered within clinical practice (Kitson et al 2013).

Findings from the literature suggest that the definition of patient-centred care can vary depending on the setting or perspective being represented (Gillespie et al 2004, Robinson et al 2008). Robinson and colleagues (2008) for example, identified four definitions for patient-centred care, including from a public policy perspective, an economic perspective, clinical perspective, and patient perspective. Patient-centred care may be conceptualised in different ways by various stakeholders (Gillespie et al 2004, Kitson et al 2013, Lewin et al 2001, Mead & Bower 2002), due to the different conditions that clinicians are working in, or as a result of individual professional interests (Gillespie et al 2004, Mead & Bower 2002). Research from the United Kingdom, for example, found that health professionals were more likely to adopt a medical model of patient-centred care, with professional priorities determining patients' needs, whereas users of health services conceptualised it in the context of a 'social or whole person model of health' (Gillespie et al 2004).

Some have argued, however, that there is growing convergence across the reported attributes of patient-centred care. Shaller (2007) for example, highlights a review of models of patient-centred care which identified six elements that appeared in three or more of the descriptions. These included: education and shared knowledge; involvement of family and friends; collaboration and team management; sensitivity to nonmedical and spiritual dimensions; respect for patient needs and preferences; free flow and accessibility of information (Shaller 2007).

The characteristics of patient-centred care

The Picker Principles of Patient-Centered Care are widely cited in the patient-centred care literature (Picker Institute 1987). These were developed from research with patients, clinicians and other hospital staff, and family members, which explored their healthcare experiences. The eight dimensions are:

- **Respect for patients' values, preferences and expressed needs:** Keeping patients informed about their health and involved in decision-making; care should be provided in a respectful atmosphere, with the patient treated with dignity. Cultural values should also be considered.

- **Coordination and integration of care:** This can help address patient feelings of vulnerability and powerlessness and relates to coordination and integration of clinical care, ancillary and support services, and front-line patient care.
- **Information, communication and education:** Providing information on clinical status, progress and prognosis; process of care; and, education relating to self-care and health promotion.
- **Physical comfort:** Pain management, assistance with daily activities and living needs, and clean and comfortable hospital surroundings and patient areas.
- **Emotional support and alleviation of fear and anxiety:** Anxiety relating to clinical status, treatment and prognosis; impact of the illness on self and wider family; and financial impacts should be attended to.
- **Involvement of family and friends:** Clinicians and caregivers accommodating family and friends; respect for their role in decision-making; and, recognition of the needs of this group who may be playing an important support role.
- **Continuity and transition:** Providing appropriate discharge information (e.g. dietary needs); coordination of ongoing treatment and services following discharge; information on clinical, social, and other support available to patients after they leave hospital.
- **Access to care:** Ensuring patients have access to healthcare settings, transport, easily scheduled appointments, access to specialists and information on the referral process.

Patient-centred care is usefully discussed in an article by NEJM Catalyst, in which they highlight that an individual's health needs and desired health outcomes drive all decisions and quality measurements within this type of care (NEJM Catalyst 2017). Patients become partners with their healthcare providers, who consider and treat patients from a range of perspectives (e.g. spiritual and social and not just clinical). Other elements of patient-centred care highlighted are reflective of the Picker Principles and include care focused on physical and emotional wellbeing, a high level of involvement by family members, appropriate and timely information-sharing, and collaborative and coordinated care (NEJM Catalyst 2017).

In their review of the literature, Kitson and colleagues (2013) identified three main themes when defining patient-centred care, as follows:

1. **Patient participation and involvement**: Comprising three key elements, this includes the patient participating as a respected and autonomous individual, the care plan based on the patient's individual needs, and care addressing the patient's physical and emotional needs.
2. **Relationship between the patient and health professional:** This includes a genuine clinician-patient relationship, open communication of knowledge and personal/clinical expertise, health professionals having appropriate skills and knowledge, and a cohesive and co-operative healthcare team.
3. **The context where the care is delivered:** Also referred to as systems issues, this incorporates access to healthcare, the therapeutic environment, having a supportive organisational system and addressing the potential systemic barriers (e.g. lack of time, staff and equipment) (Kitson et al 2013).

While there are some differences across studies and disciplines regarding the way in which patient-centred care is defined, this brief review has identified a number of common elements[16], as summarised in Table 5 below.

Table 5: Key elements of patient-centred care

Patient participation and involvement: (Barry & Edgman-Levitan 2012, Coulter & Ellins 2006, Greenhalgh et al 2014a, Kitson et al 2013, Mead & Bower 2000): This includes shared-decision making with regard to treatment (e.g. medication options), care plans based on a patient's individual needs, and the patient actively involved, and participating in, the process of securing appropriate and safe healthcare.

Respect for patients (Constand et al 2014, Kitson et al 2013, Luxford et al 2011, Mead & Bower 2000, Picker Institute 1987) : Respecting patient choice is central to patient-centred care, alongside sensitivity to patient needs. Within this model, healthcare providers demonstrate respect for patients' values, needs, and preferences, and ensure that they elicit their expectations and feelings about their health issue.

Physical comfort and emotional wellbeing addressed (Kitson et al 2013, Little et al 2001, Mead & Bower 2000, NEJM Catalyst 2017, Picker Institute 1987): Care that addresses patients' physical needs (e.g. pain); this also incorporates a holistic understanding of the patient – such as their personal and developmental issues, and attention to their emotional needs (e.g. alleviation of anxiety) and not just biomedical problems.

Effective communication (Constand et al 2014, Kitson et al 2013, NEJM Catalyst 2017, Picker Institute 1987): This incorporates healthcare providers sharing information fully, patients being kept informed about their health condition, and information being imparted in a timely manner.

Involvement of family (NEJM Catalyst 2017, Picker Institute 1987): Involvement of family should be facilitated by healthcare providers (e.g. in health-related discussions and decision-making), alongside recognition of the role they play and catering to their needs within the healthcare setting (e.g. via facilities provided).

Relationship between the patient and health professional (Barry & Edgman-Levitan 2012, Constand et al 2014, Gillespie et al 2004, Kitson et al 2013, Little et al 2001, Mead & Bower 2000): Healthcare providers who are friendly and approachable, willing to share power, and open to forming a partnership with patients. Within patient-centred care, the ideal of an egalitarian relationship is promoted, with clinicians and patients working together to ensure the best outcomes possible.

Coordinated and integrated approach to care (Kitson et al 2013, NEJM Catalyst 2017, Picker Institute 1987): A cohesive team of professionals and a coordinated care plan across different services can reduce feelings of vulnerability amongst patients.

Health promotion (Constand et al 2014, Little et al 2001): This includes how to support optimal healthcare provision, via review of the patient's history. For example, the evaluation of previous successes and failures in care via discussion with the patient, and advice regarding how to stay healthy and reduce the likelihood of future illness.

---

[16] The overlap between some of the categories presented is acknowledged, and reflective of the different ways in which patient-centred care is conceptualised in the literature.

Strategic approaches to patient-centred care in New Zealand

A focus on patient-centred care is evident in the New Zealand Health Strategy, with one of its five themes – 'people-powered' – described as taking a more people-centred approach to the provision of health services (Minister of Health 2016b). This positions patients as partners in healthcare and seeks to ensure that all New Zealanders are both informed and involved in their own health. In achieving this, the five year vision for the strategy highlights the inclusion of patients in the design of the health and disability system, patients' access to reliable information (including online), and increased involvement of patients in self-management of their own health via a range of digital technologies (Minister of Health 2016b). One of the stated visions for the future includes (Minister of Health 2016a):

> *Everyone who delivers and supports services in the health and disability system understands the needs and goals of the individual they are supporting as well as their family, whānau and community, and focuses on the person receiving care in everything that they do* (p. 18).

It is widely recognised that the New Zealand healthcare system does not always meet the needs of all patients. Of note, health disparities are evident amongst Pacific and Māori patients and their whānau (Mauri Ora Associates 2010, Ministry of Health 2014, Talemaitoga 2010).

When contemplating a patient-centred approach in this context, a number of issues require consideration. The cultural competency of healthcare providers is a critical underpinning, given that cultural misunderstanding by clinicians can create barriers and contribute to health inequities (Mauri Ora Associates 2010); there is also evidence that clinicians familiar with their patients' cultural differences offer improved patient care (Talemaitoga 2010). In addition, with the extended family the basic unit of organisation within Pacific and Māori communities, this has important implications with regard to the delivery of healthcare and what the involvement of family and whānau might look like in the context of a patient-centred approach (e.g. the need to consult with family members before accepting treatment recommendations). Other considerations include how health is conceptualised (e.g. as a holistic concept and not limited to physical illness) and the potential power differential between clinicians and patients (Mauri Ora Associates 2010, Ministry of Health 2014).

What does patient-centred care look like in practice?

Patient-centred care has many dimensions in its practical application. Some examples of patient-centred care identified in the literature are covered briefly below:

- **Customising medicine:** Medications customised to a patient's individual genetics, metabolisms, biomarkers and immune systems; e-prescribing technology to improve access, information, and efficacy (NEJM Catalyst 2017, Shaller 2007).
- **Doctor consultations:** Care is focused on the patient's presenting problem and trusted relationships are formed with doctors. Onward referrals to other services may be made (NEJM Catalyst 2017).
- **Self-care and self-management support**: This is an increasingly recognised component of patient-centred care, and seeks to support people, particularly those with long-term conditions, to adopt healthy behaviours, often within the context of their family and whānau networks. This can include building health literacy, behaviour change, tailored activity to

different cultures, and self-management support roles across health care teams (Bodenheimer et al 2002, Ministry of Health 2016).

- **Hospital setting:** The removal of strict visiting hours and visitor restrictions, with patients able to identify who can visit and when. Family members and close family networks are encouraged to be part of the care team, and participate in care decisions. A home-like environment may also be provided to meet the needs of family members (NEJM Catalyst 2017, Shaller 2007).
- **Quality of the built environment:** Patient and family members involved in the architectural design of medical centres, collaborating with architects and health professionals. Patient perspectives included in the design of health settings which are warm and welcoming spaces that increase patient comfort, privacy and convenience (Shaller 2007) .
- **Cultural competence:** Patient-centred care will engage and resonate with a wide range of cultures, rather than reflect a monocultural world view. In the New Zealand context, the role of Māori providers is highlighted in the New Zealand Health Strategy, through engaging directly with patients and whānau, and bringing a range of health providers together (Minister of Health 2016a).

Drawing on an article from NEJM Catalyst, Table 6 on the following page provides an example of what patient-centred care might look like within a primary care consultation (NEJM Catalyst 2017). Interestingly, while it presents a scenario where human interaction takes centre stage, technology-based tools also play a part in the delivery of care.

Reported benefits of patient-centred care include reduced health costs and improved health outcomes and patient satisfaction (Constand et al 2014, Little et al 2001, Shaller 2007). An article from NEJM Catalyst highlights that while the primary goal of patient-centred care is to improve individual health outcomes, healthcare systems and providers can benefit as well via improved satisfaction amongst patients and families, an enhanced reputation amongst healthcare consumers, and improved morale and productivity among clinicians and other staff. In addition, providers may experience improved resource allocations and increased financial margins across the continuum of care (NEJM Catalyst 2017). Others have identified reductions in both underuse and overuse of healthcare services (Shaller 2007).

Table 6: An example of patient-centred care in the doctor's office (NEJM Catalyst 2017)

Care is focused on the patient's problem rather than on their diagnosis. Patients have trusted, personal relationships with their doctors; empathy, two-way communication and eye-to-eye contact are crucial, alongside the ability of the doctor to see beyond a patient's immediate symptoms.

This broader consideration of the needs of the patient requires providers to offer services or onward referrals to services such as social workers, mental health providers, transportation and daily living assistance, and in some cases, language and literacy education. Doctors also employ a variety of technology-based tools, to assist patients in taking ownership of their healthcare outside of the doctor's office. These range from 24/7 online portals for scheduling appointments or getting information about their condition through to wearable technology and apps that let patients track their health statistics relating to weight, blood pressure, glucose levels, and cholesterol.

Challenges and potential responses in adopting patient-centred care

Despite the reported benefits of patient-centred care, there may be challenges in its implementation (Luxford et al 2011, Robinson et al 2008). Robinson and colleagues, in their review of the literature, identified a range of factors which can impact this, including difficulty in shifting traditional patterns of interaction, perceived increased time and cost, and a lack of certainty regarding what constitutes patient-centred care. They argue that ways to overcome these barriers are needed to ensure improvements in the quality of healthcare, increased patient satisfaction, and the promotion of patient adherence. Research advancements may also be negatively impacted if they are not addressed (Robinson et al 2008).

Patients and their families

Within a patient-centred approach, healthcare providers are required to acknowledge the pivotal role of not only patients, but also members of their family and other networks. For example, research from The Picker Institute highlighted that patients were often concerned about the impact of their illness on family and friends, and their needs therefore needed to be accommodated by clinicians and caregivers – particularly given that they were relied on for social and emotional support (Picker Institute 1987)

One study looked at patient preferences for patient-centred care within the primary care setting and identified three key elements: effective communication; a partnership approach to both the problem and treatment; and, health promotion (Little et al 2001). Interestingly, those patients who expressed a strong preference for this model of healthcare delivery were those described as 'vulnerable' – either socioeconomically or because they were very unwell or worried. The authors also cite research highlighting that older patients and those with a serious illness may not prefer a patient-centred approach, particularly in relation to shared decision-making within secondary care settings (Little et al 2001). A study from the UK which involved interviews with a range of patient/user groups and consumer organisations reported that patients viewed social, linguistic and cultural attributes as potential barriers to achieving a shared understanding of health and healthcare (Gillespie et al 2004).

Given that patients are best positioned to assess how well their needs are being met, it has been reported that many providers delivering patient-centred care are utilising information collated via a range of data collection tools (e.g. satisfaction surveys, focus groups) to feed into the design, management, and maintenance of healthcare facilities and provider practices (NEJM Catalyst 2017). Similarly, a need for patients to demand better evidence has been identified. This includes evidence that is better presented, explained, and applied in a more individualised way, taking into account individual context and patient goals (Greenhalgh et al 2014a).

Self-care and self-management support

An increasing part of patient-centred care is recognition of the role that self-care plays in people's daily health lives, and enabling people to be active participants in this process, along with their wider family networks. Health professionals across the health system are increasingly embracing their role in supporting daily health decision-making, particularly across the spectrum of long-term condition management (Battersby et al 2010, Bodenheimer et al 2002, Ministry of Health 2016).

Frameworks for self-care have been in place for some time, with the work of Lorig, Bodenheimer and colleagues widely referenced as providing core guidance in this area. Drawing on randomised control trials of self-management support, five core skills are identified for patients to develop:

1. Problem-solving: Skills that include problem definition, generation of possible solutions (including from friends and healthcare professionals), and solution implementation
2. Decision-making: Day-to-day decisions about one's health and how to manage changes in health or symptoms
3. Appropriate resource utilisation: Understanding how to access health information and services
4. Forming a partnership with a health care provider: In which the health care provider becomes teacher and partner in health
5. Taking necessary actions: These are particularly with regard to behaviour change and maintaining healthy behaviours, often with the support of action plans (Lorig & Holman 2003).

Positive findings have been found from clinical trials that people who are able to adopt improved self-management approaches are demonstrably able to show improved skill at certain tasks, better self-efficacy (one's belief in one's ability to succeed in specific situations or accomplish a task), and some markers of long-term conditions (Taylor et al 2014).

However, this behaviouralist approach has been challenged as too narrowly focused and requires a broader understanding of people's context, particularly the complexity of their individual and family networks, and the challenges posed by their everyday lives and circumstances. Hinder and Greenhalgh (2012) argue that self-management is challenged at the micro level by individuals' dispositions and capabilities; at a meso level by roles, relationships and material conditions within the family and in the workplace, school and healthcare organisation; and at the macro level by the economic climate, cultural norms, and the underlying logic of healthcare systems (Hinder & Greenhalgh 2012).

In New Zealand, qualitative work undertaken by Gandar and colleagues in 2007 echoes these issues. Their work traversed a range of issues in relation to self-care of people with long-term conditions, and the response of primary health care systems to this. They highlighted that self-care is 'dynamic, ever changing, and never fully mastered'; people will often fall in and out of personal control of health and the role (and challenge) of the health system is to work responsively to these situations (Gandar et al 2007). They also highlight that each stage of the process of long-term conditions management offers critical opportunities to engage in self-care, from the point of diagnosis, to engagement with the wider family/whānau, treatment planning, medication and ongoing monitoring (Gandar et al 2007).

Greenhalgh and colleagues (2014) propose a patient-centred approach that steps away from algorithm-based clinical practice guidance, and is more strongly focused on individual needs and contexts. While referred to as 'real evidence-based medicine', the tenets of their proposal are aligned with patient-centred care, and include:

- Making the ethical care of the patient the top priority
- Individualised evidence in a format that clinicians and patients can understand
- Expert judgement rather than mechanical rule following

- Sharing decisions with patients via meaningful conversations
- Building on a strong clinician-patient relationship and the human aspects of care
- Application of these principles at the community level for evidence based public health (Greenhalgh et al 2014a).

Clinical practice

Patient-centred care introduces a shift in the traditional roles of patients and their families – from one of passive receiver to that of active member of the healthcare team (NEJM Catalyst 2017). This approach to care may therefore require a redistribution of power between healthcare providers and patients (Gillespie et al 2004, Robinson et al 2008). In their study of how patient-centred care is understood across different stakeholders, Gillespie and colleagues highlight that users felt professionals were reluctant to change in this regard (Gillespie et al 2004). Others have discussed the historically controlling nature of the patient-provider relationship, with patients receiving little attention with regard to their preferences within traditional models of delivery (Robinson et al 2008).

Patient-centred communication is a fundamental consideration with regard to clinical practice, and includes both the impact of the provider style on the patient-provider relationship, as well as the time allocated for patient visits (Robinson et al 2008). Robinson and colleagues (2008) for example, highlight that a patient-centred approach includes using open-ending questions, allowing patients sufficient time to express themselves, and paying attention to their concerns. Of note, having 'enough time' to understand and address patient needs is more important than a specified amount of time allocated for healthcare visits (Robinson et al 2008)

Greenhalgh and colleagues (2014) claim that *real* shared decision making does not involve taking the patient through a series of 'if-then' decision options. Instead, they argue that clinicians need to find out what matters to the patient (and what is at stake) and making 'judicious use' of their professional knowledge and status. This includes introducing research evidence that informs a discussion about the best course of action, how to do it, and why (Greenhalgh et al 2014a). Others have highlighted that patient-centredness should not exclude promoting evidence-based practice, but that care should integrate both approaches (e.g. via presentation of the pros and cons of treatment options) (Robinson et al 2008).

Organisational responses

Patient-centred care requires a cultural shift in the practices of healthcare providers, and the way in which systems are designed and managed (NEJM Catalyst 2017, Shaller 2007). It has been highlighted that this change does not happen in a vacuum, with a wide range of stakeholders engaged in the process, including environmental services and parking staff alongside clinicians. This, therefore, impacts a number of organisational factors, including the hiring and training of staff, styles of leadership, and overall culture within the organisation (NEJM Catalyst 2017, Shaller 2007). At a broad level, the valuing of patient-centred care is fundamental to the success of this model – as evident in support from senior clinicians, committed buy-in from leadership teams, and ongoing communication of it underpinning the strategic vision of healthcare providers (Luxford et al 2011, Shaller 2007).

A study from the US which drew on a series of interviews with key healthcare leaders[17] found that, while some progress had been made, healthcare providers had not consistently achieved high levels of patient-centred care (Shaller 2007). A series of factors were identified as contributing to this model of care at an organisation level, as outlined below:

- **Leadership:** The single most important factor to achieving patient-centred care is the commitment and engagement of senior leadership at the CEO / Board levels. If patient-centred care is not valued at this level, the organisational transformation required to achieve it will not happen.
- **A clearly communicated strategic vision:** Organisations delivering patient-centred care need to develop a clear vision and strategic plan for how this model of care will align with priorities and processes on a daily, operational basis. These need to articulate simple elements that all staff members carry out.
- **Involvement of patients and families:** The involvement of families is crucial, and includes close friends and significant others. This should occur at a number of levels, including, for example, at the point of care delivery as well as within organisational leadership (e.g. ensuring their voice within quality improvement and programme development)
- **A supportive work environment:** The healthcare workforce should be valued and treated with the same level of respect that is expected in relation to that given to patients. This needs to be considered in relation to hiring, training, evaluating, compensating, and supporting staff.
- **Systematic measurement and feedback:** A key contributor to patient-centred care is a performance measurement system that is monitored over time. This may include multiple measures of performance such as patient and family advisory councils, patient experience surveys, and complaints. Recent research from the UK has identified that person-centred care is inadequately measured (National Voices 2017).
- **Quality of the built environment:** The quality of the physical environment can be considered in relation to: providing a welcoming setting for patients' families and friends; enabling patients to fully participate as partners in their care; fostering a connection to nature; and valuing human beings over technology.
- **Supportive technology:** Health information technology should engage patients and their families by facilitating communication with caregivers, and providing access to required information and decision support tools.

Similarly, research conducted with organisations that were recognised as high performing in relation to the patient care experience identified several factors that facilitated improved patient-centred care, including: strong, committed senior leadership; clear communication of strategic vision; engagement of patients and families throughout the institution; and, a sustained focus on staff satisfaction. Active measurement and feedback reporting of patient experiences and adequate resourcing of care delivery redesign were also important, alongside staff capacity building, accountability and incentives and a culture that was strongly supportive of change and learning (Luxford et al 2011). The authors concluded that:

---

[17] 'Leaders were identified on the basis of their recognised expertise, either as leaders of organisations that have demonstrated measurable excellence in patient-centred care or as experts working to design and implement tools and strategies for implementing patient-centred care' (Shaller, 2007; p.2)

> *Organizations that have succeeded in fostering patient-centered care have gone beyond mainstream frameworks for quality improvement based on clinical measurement and audit and have adopted a strategic organizational approach to patient focus* (p. 514).

Health professionals (including non-clinicians) may view patient-centred care as expensive, and not feasible in an environment of underfunding, restricted staffing levels, and low morale (Gillespie et al 2004). However, Gillespie and colleagues (2004) claim that a shift to a patient-centred model can be achieved within limited resources.

Meeting the needs of different stakeholders

It is important to acknowledge that different elements within this model of care may be constructed and valued differently by various stakeholders – and for a range of reasons (Kitson et al 2013, Lewin et al 2001). For example, Lewin (2001) posits that patients may be more concerned with the extent to which providers assess their level of knowledge and correspondingly adapt the consultation, rather than provider focused outcomes such as adherence to care plans.

A review of the literature undertaken by Kitson and colleagues (2012) found that various professional groups focused on different elements of patient-centred care. For example, the nursing fraternity emphasises the need to respect patient values and beliefs, while medical attention has been focused on the decision-making process between doctors and patients. As a result, the authors claim that this may impact on the potential success of implementing patient-centred care in practice (Kitson et al 2013). Others have questioned whether a targeted approach to patient-centred care can be used for particular groups of patients (Little et al 2001). In line with this, Gillespie and colleagues (2004) argue that, given the different focus of various stakeholders, refining the meaning to align with individual views may be necessary to ensure that all parties take ownership of the concept.

To deliver on the patient-centred agenda, the range of stakeholders involved – e.g. patients, clinicians, educators, policy makers, research funders – must work together (Greenhalgh et al 2014a, Kitson et al 2013). Kitson and colleagues (2013) claim that programmes or projects that enable interprofessional teams and patients to collaborate are needed. This requires support by governance processes established at organisational and governmental levels, and policy makers should consider how to make patient-centred care relevant to all members of the healthcare team, via the adoption of common language and concepts (Kitson et al 2013).

8. Needs of a virtual health system

What are the system changes that are needed to support virtual health uptake by clinicians, patients and their families?

This section considers the core requirements to implement a virtual health programme – i.e. what is needed to make it work? This is discussed below in relation to both systemic needs as well as the requirements of potential users of new technologies (e.g. clinicians and patients).

System needs

Available evidence indicates a variety of foundations are needed to support virtual health approaches. In their review of the characteristics of successfully implemented telemedical applications, Obstfelder and colleagues (2007) identified six key features:

1. *Local service delivery problems were clearly stated:* Effort was made to describe the local health-related challenges that the technology was intended to solve
2. *Telemedicine was seen as a benefit*: It was viewed as a potential solution to the challenge
3. *Telemedicine was seen as a solution to political and medical issues*: This was often linked to a need for equal access to healthcare
4. *There was collaboration between promoters and users*: Teamwork was vital and involved the initiators of the technology as well as managers, clinicians and patients
5. *Issues regarding organisational and technological arrangements were addressed*: Successful implementations were characterised by a sound grounding in established organisations and technical structures, or via the establishment of new structures
6. *The future operation of the service was considered*: Plans for future use and future financing were important drivers of success (Obstfelder et al 2007).

Relating to system needs are the systemic barriers that may limit the impact of virtual care. Table 7 below provides a list of barriers identified by participants[18] at a virtual health symposium (Jamieson et al 2015).

Table 7: Key systemic issues limiting the impact of virtual care (p. 6)

Integration issues: A system of disconnected silos
• Lack of system-level interoperability and infrastructural alignment
• System-centric approaches to privacy/security and data sharing
• Competing and misaligned incentives
• Mutual misunderstanding of the challenges/priorities of various system stakeholders
Innovation issues: A system where innovations die on the table
• Time-to-market for novel innovations is too long
• System is not structured for scalability
Equity issues: A system where the most needy have the least access

---

[18] This comprised a range of stakeholders including governmental agencies, clinicians, innovators and industry experts (Jamieson et al, 2015).

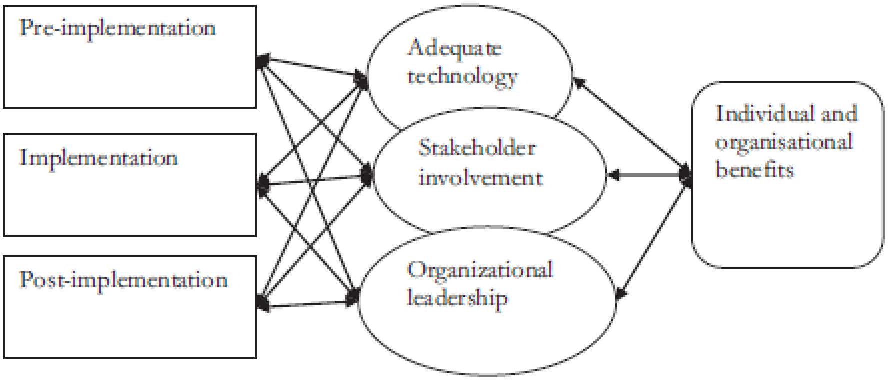
- Balancing financial viability of novel innovations with equitable access to care

Quality assurance/improvement issues: A system where this is an afterthought

- Lack of system-wide measurement that allows iterative local refinement of innovation/implementation
- Challenges in assessing the relative quality of innovations as they relate to hard clinical outcomes
- Difficulty in confidently determining how and where care should take place (virtual vs. in-person) to reduce inappropriately episodic and impersonal care

There is a complex relationship between social, technological and organisational factors in the introduction of new health technologies. It has been emphasised that that all must be considered in the development and implementation of virtual health programmes to ensure that they are not only useful and useable, but that they are also supportive of the systems within which they are operating (Cresswell & Sheikh 2013). The relationship between these three dimensions is displayed in Figure 4 below.

Figure 4: Inter-related technical, social and organisational factors over time in health information technology innovation (Source: Cresswell and Sheikh, 2013)



These, and other health system needs are discussed in the sections that follow, including innovation, technology, organisational factors, privacy and security, and other systemic needs.

Innovation

It is recognised that, while checks and balances are required within complex healthcare systems, these need to be managed carefully to ensure that they do not quash innovation (e.g. via over formalising and centralising systems) (Jamieson et al 2015). Whitten et al. (2010), for example, highlight that organisations which successfully sustain telemedicine programmes are more likely to facilitate employees being more imaginative and creative in their work. Indeed, innovation has been highlighted as a ‘necessity’ to ensure the effectiveness of virtual care programmes (Cooper & Allen 2017, Greenhalgh et al 2017b, Jamieson et al 2015). Jamieson et al (2015) argue that this is critical due to the unpredictable and evolving nature of healthcare systems, alongside the fact that local environments have different pressures, workflows and patient needs, and therefore often require different tools.

The literature suggests that an innovation is more likely to be adopted within an organisation if there is strong tension for change, if it fits well within existing work and routines, and if there is widespread support for it (Greenhalgh et al 2017b). In their review of technology implementation frameworks, Greenhalgh et al (2017) identified a range of organisational factors that support innovation, including:

a devolved structure, with individual units able to make semiautonomous decisions; organisational 'slack' (i.e. spare resources that can be channelled into new projects); good managerial relations; and, a risk-taking climate, with staff rewarded for new approaches. In addition, opportunities for sense making should be made available, alongside what has been termed 'absorptive capacity' (routines and processes by which organisation acquire and transform knowledge to create 'dynamic organisational capacity') (Greenhalgh et al 2017b).

It is proposed that new technology is easier to embed in an organisation if new and unanticipated ways of working are able to emerge (Cresswell & Sheikh 2013). In their examination of the implementation and adoption of eHealth applications in organisational settings, Cresswell and Sheikh (2013) identified that workarounds developed by users to overcome perceived shortcomings of a new system can result in efficient ways of working. While this may affect the implementation process, such experimentations and innovations should be facilitated or there is a risk that the technology may not fulfil its potential. Suggested organisational strategies to encourage this include educational sessions about innovative uses, involving suppliers and working collaboratively to discover and disseminate innovation, and the use of 'champions' to facilitate inventive uses in different specialities (Cresswell & Sheikh 2013).

Technology

Nelson et al (2017) recommend that provider organisations assess their virtual health profile to ensure the most relevant health technologies are identified to meet their needs. This includes, for example, evaluating the patient mix and population (e.g. demographic and disease characteristics) and the overall size and geography of the treatment area, including degree of regional variation. Additional considerations include the service offering mix in terms of range and depth of specialty and sub-specialty care, and the IT maturity of the organisation (e.g. in relation to data governance and quality) (Nelson et al 2017).

To ensure that new technology is accepted and adopted by users the literature suggests that it should (Broens et al 2007, Buck 2009, Cresswell & Sheikh 2013, Daim et al 2008, Jamieson et al 2015, Jennett et al 2003, Zanaboni & Wootton 2012):

1. *Be useful and offer relative advantages over existing practices*: This includes being appropriate for the job it is designed for and at least as quick as previous systems.
2. *Be tailored to the clinical needs of primary users and offer early demonstrable benefits*: If it does not meet the needs of clinicians and patients, uptake will be slow or non-existent.
3. *Be perceived as easy to use*: If technology is too sophisticated it will be badly used or not used at all.
4. *Have the potential to be adapted to support changing needs*: Creative use of equipment and services can also result in problems being solved in unanticipated ways.
5. *Have a strong fit with existing processes*: This includes its interoperability with existing technology and organisational processes.
6. *Be backed by technical support and maintenance:* This is important to ensure the smooth running of equipment, with plans for maintaining equipment and solving problems particularly important in remote areas.

Organisational factors

Jennett et al (2003) discuss 'organisational readiness' as a key driver for the successful implementation of telemedicine. Key factors contributing to this include *planning readiness:* this includes the development of a strategic plan, needs assessment and analysis (e.g. community and provider readiness for telemedicine), a business plan (e.g. outlining cost effectiveness and financial stability) and leadership readiness (e.g. programme champions and collaborative partnerships in place). In addition, *workplace readiness* which incorporates the workplace environment needs to be robust enough to both implement new services as well as cope with resultant changes. Human resources considerations include preparing staff (e.g. with training and professional development plans in place), having a telemedicine coordinator, and change management readiness. *Structural readiness* incorporates perceptions of the soundness and preparedness of the telemedicine initiative, and includes issues related to technical readiness, policy (e.g. liability and privacy), access, and communication and participation by key stakeholders (Jennett et al 2003).

Senior leadership support is important (Cresswell & Sheikh 2013, Greenhalgh et al 2017b, Whitten et al 2010), and includes communicating to users the likely benefits or trade-offs and anticipated timeframes for the introduction of new technologies (Cresswell & Sheikh 2013). In one survey of successful telemedicine programmes, an effective strategy was simply based on senior management being helpful and communicating with colleagues new ways to use telemedicine (Whitten et al 2010). The use of lead professionals or 'champions' can also ensure that new technologies are well-received by end users (Cresswell & Sheikh 2013, Greenhalgh et al 2017b). For example, they may act as an intermediary between management, IT staff and clinicians – and can provide training and support to users, whilst also highlighting problematic issues (Cresswell & Sheikh 2013).

Research exploring the characteristics of organisations which had successfully sustained telemedicine programmes identified that the development of a business plan which demonstrated a clear goal and the mission of the organisation was important. This incorporated formal definitions of both the programme and job role descriptions, indicating that job duties were not ad hoc (Whitten et al 2010) .

It is important to recognise that, given the complex relationship between social, technological, and organisational dimensions, there is no 'one size fits all' or prescriptive approach to successful implementation, and organisations need to be agile in anticipating and adjusting strategies as innovations evolve (Cooper & Allen 2017, Cresswell & Sheikh 2013, Greenhalgh et al 2017b). Moreover, given the likelihood of unintended consequences at any stage in the process, the need for flexibility and for systems to be adaptable is paramount (Cresswell & Sheikh 2013). Based on the findings of their review, Greenhalgh and colleagues (2017) state that:

> *Both formative and summative evaluation of the programme's success will need to use imagination and multiple methods, along with a narrative account of what happened and why, in order to capture its multiple interdependencies, nonlinear effects, and unintended consequences* (p. 14).

Privacy and security

Healthcare consumers often have concerns about personal health information being leaked and thus will require reassurance that systems are safe and well-protected (Deloitte 2016a). A systematic review of barriers to health information exchange systems in the United States found that patients often hesitate to participate and consent to the use of their health information because of concerns about their privacy (Almoaber & Amyot 2017). Furthermore, policies imposed because of privacy and security concerns can themselves act as barriers, and can result in missing medical information that would otherwise support important health decision-making (Almoaber & Amyot 2017).

These concerns, whilst acting as barriers, are grounded in genuine concerns for the impacts of data security breaches. A 2015 report discussing the technological developments in healthcare highlights that such improvements are accompanied by 'pervasive' and 'persistent' cyber-attacks, with a need for providers to implement programmes that provide protection against cloud-based computing attacks, and ensure patient confidentiality is not breached via medical devices and privileged access accounts (Deloitte 2015).

Other system needs

Other recommendations evident in the literature include:

- The introduction of pilots before scaling initiatives, a well-crafted strategy for both short and long term investments, and recognition that hands-on human expertise will still be required and therefore planning for strategic investment in people, processes and premises is necessary (Cooper & Allen 2017).
- Ensuring that appropriate allowances are made for the work involved in implementing health technologies which is typically extensive and often underestimated at the planning stage (Greenhalgh et al 2017b).
- When considering the sustainability of initiatives, improved collaboration between telemedicine networks may play a role , alongside a reflexive and adaptable approach (Al-Shorbaji 2013, Greenhalgh et al 2017b).
- Common with any new initiative, there needs to be a clear driver for change, or problem that is being addressed (often termed as a "burning platform") (Neutze & Stortz 2018).
- Staff need to be convinced that any IT-related changes in the health setting will improve the efficiency of their practice whilst also improving the quality of patient care (Protti et al 2009).

Considerations in the New Zealand health system context

This section offers some brief considerations for implementing virtual health in the context of the New Zealand public health system.

Organisational and funding structures

In New Zealand, the funding structures of DHBs pose some challenges in implementing virtual health approaches. This is particularly when virtual health is conceptualised in the 'evolutionary' approach discussed earlier, which brings together both health care and health promotion approaches. In settings such as the United States, systems that utilise risk-based payment models are motivated to engage their patients to help manage utilisation of services. This enables organisations to invest in population health initiatives that can support better quality outcomes and reduced need for health services utilisation (Hunt et al 2014).

An observation made in conversations with Waikato DHB staff in the course of this review is that New Zealand's system is not geared towards incentivised risk-based models in the same way, and population health services' funding has tended to be either siloed in public health units, or fragmented across multiple settings such as primary health organisations. This has meant that clinical health services and population health services have generally been disconnected from each other.

Furthermore, DHBs have only limited ability to compel independent health service providers, such as primary care providers, to work within new models of care. They can offer some financial incentives, but have little directive capability. They therefore need to be able to work constructively and create platforms for change that a broad cross-section of health care providers are willing to be part of. Taken together, working towards the evolutionary model of virtual health will require fit for purpose organisational systems, and also fit for purpose inter- and intra-organisational relationships that can forge new ways of working.

Capacity for virtual health

There appears to be much variation in the capacity and readiness for virtual health approaches in New Zealand. A 2014 stocktake (Kerr 2014) showed that telehealth initiatives were present across most DHBs, but this was often based around teleconferencing. Some had governance and clinical leadership groups with oversight on telehealth, but it was perceived that there was a substantial way to go to realise telehealth's potential.

There was seen to be a general lack of evaluation and documentation on benefits realisation and health outcomes to justify the investment necessary, and few even had the means to accurately count consultations. Key barriers to its uptake were connectivity, infrastructure investment, and adequate technical support. There was seen to be a need nationally for generic guidelines, case studies and advocacy in this space.

Privacy and data security frameworks

It is beyond the scope of this review to assess how legislative, regulatory and privacy frameworks in New Zealand impact on virtual health approaches. This will however be an important consideration from the perspective of the potential constraints and opportunities that will affect developing virtual health approaches in a safe and effective manner; and at a policy level, if current frameworks are fit for purpose in supporting virtual health systems and the population health gains that are sought.

User needs

The needs of users are often overlooked in the development of virtual health applications (Buck 2009). Users in this context can include both healthcare staff and providers, as well as patients or receivers of care. Buck (2009) argues that the value proposition of the application must be made very clear to these groups, and that they must be able to easily identify the potential personal benefits:

> *Just like in an advertisement, the user must immediately understand the product's right to exist. Users must sense intuitively what the pay-off will be for them if they start using the application.* (p. 55)

Given that end users are likely to resist systems that are seen to be inadequate or at odds with their values and roles (Cresswell & Sheikh 2013), the need to consider and/or involve them in the planning of virtual health/telemedicine interventions is widely recognised (Cresswell & Sheikh 2013, Daim et al 2008, Greenhalgh et al 2017b, Nelson et al 2017). This can include clinical and operational staff, third-party contractors, alongside patients and caregivers (Nelson et al 2017). Greenhalgh and colleagues (2017) argue that:

> *A technology introduced into an organisation is open to multiple interpretations; successful embedding will require opening up a space for dialogue, listening to concerns, and allowing people time to argue out the challenges and learn from the experiences of others before a 'closure' over possible interpretations is reached* (p. 9).

Nelson et al (2017) state that it is important to have representatives from each of these groups involved during planning and implementation, with different tactics required for each. For example, they recommend that organisations should consider creative financial incentives for clinical staff, and supplement salaries for operational staff. For consumers, they suggest that organisations utilise a Customer Relationship Management (CRM) tool, as a means of attracting, engaging, and retaining patients. Other stages where user involvement or support is particularly important includes during decision-making on software procurement (i.e. pre-implementation phase), and the early post-implementation phase, where user support groups are likely to be helpful (Broens et al 2007, Cresswell & Sheikh 2013).

As reported in earlier sections, acceptance by professional staff has been identified as the most important factor in determining whether or not a technology-supported service succeeds (Greenhalgh et al 2017b). The need for these users to perceive advantages over existing practises and systems has therefore been highlighted as crucial, and includes viewing new systems as substantially improving the way that they can practice (Zanaboni & Wootton 2012). In facilitating the use of new technologies, as highlighted in a previous section, users need to perceive it to be easy to use, to experience early demonstrable benefits and to be able to use it creatively, if required. Training of clinical staff in the use of virtual health IT systems is also important to reinforce familiarity and ensure skill sets are at an appropriate level (Broens et al 2007). Other considerations in meeting user needs includes ensuring that the professional values of clinicians, and the intrinsic values of patients, are respected; further, they must not feel a loss of control in utilising telemedicine or other similar applications (Buck 2009).

Change models in healthcare

The ability to manage change is a key challenge for healthcare systems. In New Zealand, virtual health may add an additional layer of challenge because of the interface between the DHB organisation, clinicians, patients, the technological interfaces, as well as the relationships with related organisations outside of the DHB itself. Implementing the changes associated with virtual health approaches therefore presents complex challenges that bring together technology, established human and organisational systems, funding and delivery systems, along with hierarchies and power relationships.

Previous sections discussed the disruption that new technology and models of care can bring to healthcare systems, and approaches that can address these challenges. In this section, we briefly discuss change management approaches, including those that have been applied in healthcare settings that may support adaptation to new models of delivery that a virtual health approach would entail. We conclude with a discussion on human-centred design approaches that we suggest provides a useful bridge between change management and technological innovation.

Change management is essentially an approach to getting individuals and groups ready, willing and able to implement and sustain new ways of working. Change management approaches acknowledge that change can be disruptive and requires a substantial commitment by health care organisations, if the intended benefits of enhanced service delivery, patient care and health outcomes are to be achieved (McDeavitt et al 2012).

The literature delineates between planned change and emergent change approaches. Planned change approaches, drawing and building on the work of Lewin (1951), look at change as a transitional approach between fixed states, with a series of pre-planned steps that are employed (Lewin 1951). They tend to emphasise a planned set of processes, timetables and objectives developed by management (Antwi & Kale 2014). These approaches have been highly influential, but many have been criticised for overstating the role of management and under-valuing the contribution of employees in the change process.

Antwi and Kale's 2012 review of change management approaches in healthcare positions Lewin's 3-step model of unfreezing, moving and refreezing as the core framework for organisational change thinking that flowed through into a range of other planned change approaches. Each of these provide as a means of understanding how social groups are formed, motivated and maintained. The table below is drawn from Antwi and Kale's work, and also includes Prosci's ADKAR model which similarly offers a sequential approach to organisational change.[19]

---

[19] ADKAR Change Management Model Overview: https://www.prosci.com/adkar/adkar-model. Accessed 4 December 2017.

Table 8: Models of planned change (Antwi and Kale 2014)

Lewin (Lewin 1951)	Bullock and Batten (Bullock & Batten 1985)	Kotter (Kotter 2010)	Lippit (Lippitt et al 1958)	Prosci
Unfreezing: De-stabilising the status quo and create buy-in for change	Phase 1: Exploration – Organisation makes a decision on the need for change	Step 1: Establish a sense of urgency	Phase 1: Diagnose the problem	Awareness of the business reasons for change
			Phase 2: Assess motivation and capacity for change	
	Phase 2: Planning – Understand the problem	Step 2: Create a guiding coalition	Phase 3: Assess change and agent's motivation and resources	
		Step 3: Develop a vision and strategy		Desire to engage and participate in the change
Moving: Identifying what needs to be changed and develop an implementation strategy	Phase 3: Action – Changes identified are agreed upon and implemented	Step 4: Communicate the change vision	Phase 4: Select a progressive change objective	Knowledge about how to change
		Step 5: Empower employees for broad-based action		Ability to realise or implement the change at the desired level
		Step 6: Generate short-term wins	Phase 5: Choose appropriate role of the change agent	
		Step 7: Consolidate change and produce more change		
Refreezing: Stabilising the group at a new mode of behaviour	Phase 4: Integration – Stabilise and embed change	Step 8: Anchor new opportunities in the culture	Phase 6: Maintain change	Reinforcement to ensure change sticks
			Phase 7: Terminate the helping relationship	

With specific reference to healthcare, Lukas et al's Organisational Model for Transformational Change in Healthcare Systems (2007) proposes five essential elements for change that are broadly in line with the planned approaches described above:

1. Impetus to transform
2. Leadership commitment to quality
3. Improvement initiatives that actively engage staff in meaningful problem solving
4. Alignment to achieve consistency or organisation-wide goals with resource allocation at all levels of the organisation
5. Integration to budge transitional intra-organisational boundaries between individual components (Lukas et al 2007).

Emergent change models are more recent, and emphasise the interaction of organisational context and processes, rather than a fixed, staged approach. These models position change within the context of complex organisations and systems, which can be both dynamic and resistant to change. The table below outlines key features of three models of emergent change:

- Hining and Greenwood's Model of Change Dynamics applies change as an unfolding series of circumstances and actions stemming from unanticipated consequences and a moving context (Hinings & Greenwood 1989).
- Kanter et al's 'Big Three' model of organisational change provides a response to a range of challenges, including the difficulty in making change stick; the limitations of managerial action; the challenges of established systems to enabling change; and that the need for change may make it harder to occur. Flowing from that are the roles of 'motions' for change within organisations; forms of change; and roles for change (Kanter et al 1992).
- Pettigrew's Context – Content – Process model acknowledges the complexity and constancy of change, but also posits change as purposive (Pettigrew 1987).

Table 9: Models of emergent change

Hinings and Greenwood (Hinings & Greenwood 1989)	Kanter et al (Kanter et al 1992)	Pettigrew (Pettigrew 1987)
• Situational constraints that may necessitate change, or enhance/thwart an organisation's ability to achieve change • Interpretive schemes: Ideas, beliefs and values that underlie the operations of an organisation • Interests: Orientation and motivations of individual members of an organisation • Dependencies of power: Power relations within an organisation • Organisational capacity: Skill of leadership to generate commitment and excite for change, and ability to construct and communicate its vision for change	• 3 Motions: Organisation-environment motion, intra-organisational components' motion, and intra-organisational individuals motion • 3 Changes: Identity change, coordination change, and control change • 3 Roles: Change strategist, change implementer and change recipient.	• Context: An organisation's internal environment of structures, culture, power distribution, skill base, and resources; and the external environment of economic, social and legal circumstances • Content: Components of change, drawing on both internal and external factors and opportunities • Process: Operational activities undertaken to materialise change, including the logic of change implementation; managing change transition, and curtailing resistance to change.

On the face of it, these emergent change models could have application to virtual health approaches, given the challenges of technological uptake identified in previous chapters, the power shift that occurs with adoption of virtual health approaches, and the constant process of adaption and improvement that are required – all of which may work against a staged process of design and implementation. At the same time however, a fundamental of planned change – that there is agreement on an identified problem and a shared understanding of the causes of the problem – is critical to building a platform for change to take place, and this also has much relevance for virtual health approaches.

A further platform in change, highlighted by Greenhalgh (2018), is the role of absorptive capacity in any organisation to transform knowledge into change. This relates to its capacity to acquire knowledge from external sources; to assimilate the knowledge gained by individuals across the organisation; to transform that into practical, workable forms that can be applied; and to implement these in practice.

Our research has not identified any particular change management approach that has a strong history of success in health care settings; and their application is highly likely to be context-dependent, based on the skills and experience of those implementing change approaches, and the receptiveness of different organisational settings to change. Whilst change management strategies are valuable for providing support in the broader organisational context, what appears more important is the extent to which virtual health technologies are useful, easy to use, meeting the needs of their intended users, and engage clinicians and patients in their design. This is discussed further below.

Involving patients in service design and improvement

As patient-centred care has become increasingly recognised with healthcare delivery, new challenges have been laid in healthcare planning to involve people (including patients, their families and carer networks) in the design of health services.

Human-centred design is a concept that is being brought into the design of many services and products, including healthcare, by placing the service journey, experiences and challenges faced by service users at the centre of a design process. This then drives innovation, improvement and greater effectiveness in service delivery. The application of user-centred design is often multi-disciplinary and integrative, working across the spectrum of services.

In health services, user-centred design is applied in a range of innovations, including digital tools, inpatient, outpatient and primary care services, and disease management programmes. Underlying principles include a focus on users and tasks, empirical measurement of usability, and iterative co-design, testing and monitoring (Dabbs et al 2009). Although often demanding, a key value of user involvement in service design is the co-creation with clinicians in a way that actively responds to the user experience (Greenhalgh 2018).

Human-centred design requires designers to consider every problem from the viewpoint of the end-user and to repeatedly test assumptions with real users in actual situations along the way, ultimately producing a product that better meets the needs of the intended user (Ward et al 2009). For virtual health, human-centred design offers a way of designing, testing, prototyping new ways of working, ahead of systematic organisation- or area-wide change processes. This approach offers a much broader, collaborative, and inclusive view of who needs to be part of the process of co-creating initiatives that will actually work in the real world (Bason 2013). This will necessitate an understanding of both clinical and patient needs as active participants in the system.

Human centred-design approaches can complement change management process, by testing and building optimal systems to meet organisational goals, which a change process is then able to shepherd through the organisation and broader healthcare system.

Typical elements of human centred design include the following:

- Inspiration: Understanding the nature of the challenge that is being addressed; building a design team; researching the issue, interviewing and observing people, workflows and situations; and exploring priorities.
- Ideation: Identifying opportunities for design; generating ideas; building prototypes and obtaining feedback. This occurs iteratively and enables approaches to be steadily refined and improved.
- Implementation: A process of short-term live prototyping in the real world; resource assessment; building partnerships and funding opportunities; further iteration; defining success and monitoring/evaluating against success criteria; and broader system implementation (IDEO.org. 2015).

Complementing human-centred design approaches, the involvement of lay people in clinical governance is a further way in which service users can bring their experience of services on to boards, steering groups and education programmes, and ultimately improve the quality of service delivery. This can provide an ever-present reflection for health service leaders of who the services are intended to benefit. However, some researchers caution the power imbalances that can occur in these process, including the wariness of people to criticise clinicians who have cared for them (Greenhalgh 2018). This nevertheless remains an important vehicle for supporting patient-centred care in the design of health services.

9. Conclusions and strategic implications

This review points to a clear sense of emerging value for many aspects of virtual health approaches, particularly different forms of telemedicine. There is clearly potential for virtual health to deliver benefits to patients, including improved access to healthcare and health/wellness education; increased patient engagement; improved patient satisfaction and experiences; reductions in health costs; and improved patient outcomes. Whilst virtual health is not a panacea for all challenges facing the health system, it is emerging as a credible and increasingly important part of healthcare delivery in the 21st century.

For health systems, virtual health can offer improved operation efficiencies, reductions in costs; address workforce shortages and accessing untapped resources. However, for both patients and health services, the benefits are not consistent, and are likely to be influenced by design and implementation factors, as well as the broader context of delivery.

In a strategic sense, the evidence base to date is also largely concentrated in the more traditional areas of telehealth and telemedicine. Clearly however, the trajectory of development is towards more evolutionary models that are spanning multiple parts of the health system and connecting patients with both health services and opportunities to improve and maintain health.

From this review, it is clear that implementing technology projects in healthcare is challenging, particularly so where the technology meets organisational, social, political and system complexities that can inhibit or prevent its wider uptake.

Virtual heath will challenge established systems and relationships, therefore being clear about the problem it is addressing and the value it offers to its users (both clinicians and patients) will be a critical part of the change process.

Key factors that appear likely to support virtual health approaches are the readiness of the organisation to implement technology and support staff through the process; the presence of clinical champions; the involvement of clinicians and patients in design, selection and implementation of technology; reliability and user-friendliness of technology; training; and adoption/spread through peer networks and communities of practice.

A range of system needs are apparent, including an environment that fosters innovation, technological systems, supportive organisational settings and fit for purpose privacy and data security frameworks. Virtual health systems that meet the needs of users, and are seen to be useful, beneficial and relevant, are intrinsic to their success.

Patient-centred care approaches have the potential to reorient care from an expert-based medical model to a model that considers the whole person, and his or her family, social and economic circumstances.

Patient-centred care brings with it an appreciation of the lived experience of illness, incapacity and the often-circuitous pathways back to health. Patient-centred care works across and integrates multiple care settings, and supports better access to care; and alongside this, supports and empowers patients to better manage their own health.

For virtual health systems, this review points to a range of areas where virtual health will take centre stage in supporting patient-centred care. They include:

- Design and application of digital tools to support health management and improvement
- Tailored information and resources that align with a person's health, social and cultural needs, and which are tailored to different stages of care (such as for people with long-term conditions)
- Web-based and other electronic interfaces connecting patients with their clinicians and providing accessible treatment plans
- Access to patients' own health records
- Improved connections between healthcare providers to better integrate patient care
- Interactive mapping of health care services and resources to support the patient journey
- Engagement with wider family networks using virtual health tools, to support the wider familial context of health care.

Grasping the potential of virtual health and patient-centred care approaches will require change at multiple levels: for patients, it will be to ensure access to the technology, skills and right motivations to engage with the opportunity; for clinicians this will require an reorientation from the expert-driven models, to engaging with patients and their families as experts in the reality, potential and challenges of their own lives; and for health systems to embed patient-centred thinking throughout leadership, strategy, systems and organisational cultures.

References

Accenture Consulting. 2015. Virtual Health: The Untapped Opportunity to Get the Most out of Healthcare, Accenture Consulting, United States of America

Akar J, Hummel J. 2016. Editorial commentary: Virtual medicine—A better reality? *Trends in Cardiovascular Medicine* 26: 731-32

Al-Shorbaji N. 2013. Is there and do we need evidence on eHealth interventions? *IRBM* 34: 24-27

Almoaber B, Amyot C. 2017. Barriers to Successful Health Information Exchange Systems in Canada and the USA: A Systematic Review. *International Journal of Healthcare Information Systems and Informatics (IJHISI)* 12: 44-63

Antwi M, Kale M. 2014. Change Management in Heathcare: Literature Review, The Monieson Centre for Business Research in Healthcare, Kingston, Ontario

Barry M, Edgman-Levitan S. 2012. Shared Decision Making — The Pinnacle of Patient-Centered Care. *New England Journal of Medicine* 366: 780-81

Bason C. 2013. Design-Led Innovation in Government. *Stanford Social Innovation Review* Spring 15-17

Battersby M, Von Korff M, Schaefer J, Davis C, Ludman E, et al. 2010. Twelve evidence-based principles for implementing self-management support in primary care. *Joint Commission Journal on Quality and Patient Safety* 36: 561-70

Behkami N, Daim T. 2016. Exploring technology adoption in the case of the Patient-Centered Medical Home. *Health Policy and Technology* 5: 166-88

Bodenheimer T, Lorig K, Holman H, Grumbach K. 2002. Patient self-management of chronic disease in primary care. *JAMA* 288: 2469-75

Bourne K, Nash A, Houghton K. 2017. Pillars of communities: Service delivery professionals in small Australian towns 1981 – 2011, The Regional Australia Institute, Canberra

Bradford N, Caffery L, Smith A. 2016. Telehealth services in rural and remote Australia: a systematic review of models of care and factors influencing success and sustainability. *Rural and Remote Health* 16

Brewster L, Mountain G, Wessels B, Kelly C, Hawley M. 2014. Factors affecting front line staff acceptance of telehealth technologies: a mixed-method systematic review. *Journal of Advanced Nursing* 70: 21-33

Broens T, Huis in't Veldw R, Vollenbroek-Huttenw M, Hermens H, Halteren A, Lambert J. 2007. Determinants of successful telemedicine implementations: a literature study. *Journal of telemedicine and telecare* 13: 303-09

Buck S. 2009. Nine human factors contributing to the user acceptance of telemedicine applications: a cognitive-emotional approach. *Journal of telemedicine and telecare* 15: 55-58

Bullock R, Batten D. 1985. It's just a phase we're going through: a review and synthesis of OD phase analysis. *Group & Organization Management* 10: 383-412

Conectus. 2018. Mokopuna Ora: Health Pregnancy for NZ Mums and Babies. Auckland Uniservices Ltd.,

Constand M, MacDermid J, Dal Bello-Haas V, Law M. 2014. Scoping review of patient-centered care approaches in healthcare. *BMC health services research* 14: 271

Cooper T, Allen S. 2017. 2018 Global health care outlook. The evolution of smart health care, Deloitte, New York

Coulter C, Ellins J. 2006. Patient-focused interventions. A review of the evidence, The Health Foundation, London

Cresswell K, Sheikh A. 2013. Organizational issues in the implementation and adoption of health information technology innovations: an interpretative review. *International journal of medical informatics* 82: e73-86

Dabbs A, Myers B, Mc Curry K, Dunbar-Jacob J, Hawkins R, et al. 2009. User-centered design and interactive health technologies for patients. *Computers, informatics, nursing: CIN* 27: 175

Daim T, Tarman R, Basoglu N. *Proceedings of the 41st Annual Hawaii International Conference on System Sciences (HICSS 2008)2008*: 100-00.

Dale MC. 2017. Whakapono: End child poverty in Maori whanau, Child Action Poverty Group, Auckland

Darkins A. 2014. The Growth of Telehealth Services in the Veterans Health Administration Between 1994 and 2014: A Study in the Diffusion of Innovation. *Telemedicine and e-Health* 20: 761-68

Deloitte. 2015. 2016 Global health care sector outlook. Battling costs while improving care, Deloitte, London

Deloitte. 2016a. 2016 Survey of U.S. Health Care Consumers, Deloitte, New York

Deloitte. 2016b. 2017 global health care outlook. Making progress against persistent challenges, Deloitte, London

Department of Health. 2012. The power of information: Putting all of us in control of the health and care information we need, Department of Health, London

Dobson R, Whittaker R, Bartley H, Connor A, Chen R, et al. 2017. *Development of a Culturally Tailored Text Message Maternal Health Program: TextMATCH*. e49 pp.

Doolan-Noble F, Smith D, Gauld R, Waters D, Cooke A, Reriti H. 2013. Evolution of a health navigator model of care within a primary care setting: a case study. *Australian Health Review* 37: 523-28

Edirippulige S, Armfield N. 2017. Education and training to support the use of clinical telehealth: A review of the literature. *Journal of telemedicine and telecare* 23: 273-82

Ekeland A, Bowes A, Flottorp S. 2010. Effectiveness of telemedicine: a systematic review of reviews. *International journal of medical informatics* 79: 736-71

Elwyn G, Scholl I, Tietbohl C, Mann M, Edwards A, et al. 2013. “Many miles to go …”: a systematic review of the implementation of patient decision support interventions into routine clinical practice. *BMC Medical Informatics and Decision Making* 13: S14

Fiato K. 2012. *Enhancing electronic medical records (EMR) implementation: Peer support interventions influencing nurses' acceptance and use (Order No. 3499912)*. Capella University

Gagnon MP, Legare F, Labrecque M, Fremont P, Pluye P, et al. 2009. Interventions for promoting information and communication technologies adoption in healthcare professionals. *The Cochrane database of systematic reviews*: CD006093

Gandar P, Dale S, Young B, Field A. 2007. Health My Way: People-Centric Self Care, Synergia Ltd, Auckland

Gillespie R, Florin D, Gillam S. 2004. How is patient-centred care understood by the clinical, managerial and lay stakeholders responsible for promoting this agenda? *Health expectations* 7: 142-48

Greenhalgh T. 2017. Why do so many technology projects in healthcare fail? In *The Healthcare Leadership Academ*, ed. M Redman

Greenhalgh T. 2018. *How to Implement Evidence-Based Healthcare*. Chichester, W. Sussex: John Wiley & Sons Ltd.

Greenhalgh T, A’Court C, Shaw S. 2017a. Understanding heart failure; explaining telehealth – a hermeneutic systematic review. *BMC Cardiovascular Disorders* 17: 156

Greenhalgh T, Howick J, Maskrey N. 2014a. Evidence based medicine: a movement in crisis? *BMJ : British Medical Journal* 348

Greenhalgh T, Swinglehurst D, Stones R. 2014b. Rethinking resistance to ‘big IT’: a sociological study of why and when healthcare staff do not use nationally mandated information and communication technologies. *Health Serv Deliv Res* 2

Greenhalgh T, Wherton J, Papoutsi C, Lynch J, Hughes G, et al. 2017b. 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. *Journal of medical Internet research* 19: e367

Hanlon P, Daines L, Campbell C, McKinstry B, Weller D, Pinnock H. 2017. Telehealth Interventions to Support Self-Management of Long-Term Conditions: A Systematic Metareview of Diabetes, Heart Failure, Asthma, Chronic Obstructive Pulmonary Disease, and Cancer. *Journal of medical Internet research* 19: e172

Harrop V. 2001. Virtual healthcare delivery: defined, modeled, and predictive barriers to implementation identified. *Proceedings of the AMIA Symposium*: 244-8

Health Navigator Charitable Trust. 2018. Health Navigator New Zealand. Health Navigator Charitable Trust

Hendy J, Barlow J. 2012. The role of the organizational champion in achieving health system change. *Social science & medicine* 74: 348-55

Henry E, Newth J, Spiller C. 2017. Emancipatory indigenous social innovation: Shifting power through culture and technology. *Journal of Management and Organization* 23: 786-802

Hinder S, Greenhalgh T. 2012. " This does my head in". Ethnographic study of self-management by people with diabetes. *BMC health services research* 12: 83

Hinings C, Greenwood R. 1989. *The dynamics of strategic change (cited in Antwi and Kale)*. Oxford: Basil Blackwell.

Hoeft T, Fortney J, Patel V, Unützer J. 2018. Task-Sharing Approaches to Improve Mental Health Care in Rural and Other Low-Resource Settings: A Systematic Review. *The Journal of rural health* 34: 48-62

Honey M, Bycroft J, Tracey J, Boyd M, McLachlan A. 2010. Quality processes that maximise the Health Navigator web portal as an enabler for consumers and health professionals. *Health Care and Informatics Review Online* 14: 12-18

Hunt D, Scheinrock M, Vyas S. 2014. Virtual Health: Can it help your organization create a transformational culture while bending the cost curve?, Deloitte, New York

IDEO.org. 2015. The Field Guide to Human-Centred Design, IDEO, San Francisco

Inglis SC, Clark RA, Dierckx R, Prieto-Merino D, Cleland JGF. 2015. Structured telephone support or non-invasive telemonitoring for patients with heart failure. *Cochrane Database of Systematic Reviews*

Jamieson T, Wallace R, Armstrong K, Agarwal P, Griffen B, et al. 2015. Virtual Care: A Framework for a Patient-Centric System, Women’s College Hospital Institute for Health Systems Solutions and Virtual Care, Toronto

Jarvis-Selinger S, Chan E, Payne R, Plohman K, Ho K. 2008. Clinical telehealth across the disciplines: lessons learned. *Telemedicine journal and e-health : the official journal of the American Telemedicine Association* 14: 720-5

Jasperson J, Carter P, Zmud RW. 2005. A comprehensive conceptualization of the post-adoptive behaviors associated with IT-enabled work systems. *MIS Quarterly* 29: 525–57

Jennett P, Yeo M, Pauls M, Graham J. 2003. Organizational readiness for telemedicine: implications for success and failure. *Journal of telemedicine and telecare* 9: S2:27–30

Jung C, Padman R. 2014. Virtualized healthcare delivery: Understanding users and their usage patterns of online medical consultations. *International journal of medical informatics* 83: 901-14

Kanter R, Stein B, Jick T. 1992. *The Challenge of Organizational Change: How Companies Experience It and Leaders Guide It*. New York: Free Press.

Kerr P. 2014. New Zealand Telehealth Stocktake: District Health Boards, NZ Telehealth Forum, Christchurch

Kitsiou S, Paré G, Jaana M. 2015. Effects of Home Telemonitoring Interventions on Patients With Chronic Heart Failure: An Overview of Systematic Reviews. *Journal of medical Internet research* 17: e63

Kitson A, Marshall A, Bassett K, Zeitz K. 2013. What are the core elements of patient-centred care? A narrative review and synthesis of the literature from health policy, medicine and nursing. *Journal of Advanced Nursing* 69: 4-15

Kotter J. 2010. Kotter’s 8-step change model. Mind Tools. Retrieved from http://www. mindtools. com/pages/article/newPPM_82. htm (cited in Antwi and Kale).

Lewin K. 1951. *Field theory in social science: Selected theoretical papers* New York: Harper & Row.

Lewin S, Skea Z, Entwistle V, Zwarenstein M, Dick J. 2001. Interventions for providers to promote a patient-centred approach in clinical consultations. *The Cochrane database of systematic reviews* 4

Lippitt R, Westley B, Watson J. 1958. *The Dynamics of Planned Change (cited in Antwi and Kale)*. New York: Harcourt, Brace & World.

Little P, Everitt H, Williamson I, Warner G, Moore M, et al. 2001. Preferences of patients for patient centred approach to consultation in primary care: observational study. *BMJ* 322: 468

Lorig K, Holman H. 2003. Self-management education: history, definition, outcomes, and mechanisms. *Annals of behavioral medicine* 26: 1-7

Lukas C, Holmes S, Cohen A, Restuccia J, Cramer I, et al. 2007. Transformational change in health care systems: an organizational model. (Cited in Antwi and Kale). *Health care management review* 32: 309-20

Luxford K, Safran D, Delbanco T. 2011. Promoting patient-centered care: a qualitative study of facilitators and barriers in healthcare organizations with a reputation for improving the patient experience. *International Journal for Quality in Health Care* 23: 510-15

Mair F, May C, O'Donnell C, Finch T, Sullivan F, Murray E. 2012. Factors that promote or inhibit the implementation of e-health systems: an explanatory systematic review. *Bulletin of the World Health Organization* 90: 357-64

Mauri Ora Associates. 2010. Best health outcomes for Pacific Peoples: Practice implications, Medical Council of New Zealand, Wellington

McDeavitt J, Wade K, Smith R, Worsowicz G. 2012. Understanding Change Management. *PM&R* 4: 141-43

Mead N, Bower P. 2000. Patient-centredness: a conceptual framework and review of the empirical literature. *Social science & medicine* 51: 1087-110

Mead N, Bower P. 2002. Patient-centred consultations and outcomes in primary care: a review of the literature. *Patient education and counseling* 48: 51-61

Menachemi N, Burke D, Brooks R. 2004. Adoption Factors Associated with Patient Safety-Related Information Technology. *Journal for Healthcare Quality* 26: 39-44

Meyer L. 1996. It's about time — Virtual health management. *The Case Manager* 7: 53-69

Minister of Health. 2016a. New Zealand Health Strategy: Future direction, Ministry of Health, Wellington

Minister of Health. 2016b. New Zealand Health Strategy: Roadmap of actions 2016, Ministry of Health, Wellington

Ministry of Health. 2014. The Guide to He Korowai Oranga: Māori Health Strategy 2014, Ministry of Health, Wellington

Ministry of Health. 2016. Self-management Support for People with Long-term Conditions (2nd edn), Ministry of Health, Wellington

Morris ZS, Wooding S, Grant J. 2011. The answer is 17 years, what is the question: understanding time lags in translational research. *J R Soc Med* 104: 510-20

Morton E. 2008. *Use and Acceptance of Electronic Medical Records: Factors Affecting Physician Attitudes*. Drexel University, Pennsylvania

National Health Committee. 2010. Rural Health: Challenges of distance, opportunities for innovation Ministry of Health, Wellington

National Voices. 2017. Person-centred care in 2017. Evidence from service users, National Voices, London

Navilluso Medical Ltd. 2018. iMOKO: Healthier Kids @ Your Fingertips. iMOKO

NEJM Catalyst. 2017. What is patient-centred care?

Nelson J, Sung B, Venkataram S, Moore J. 2017. Transforming care delivery through virtual health. Help increase access, improve value, and establish competitive advantage by operationalizing technology solutions, Deloitte, Chicago

Neutze D, Stortz L. 2018. Quality Improvement In *Chronic Illness Care*, pp. 419-31: Springer

Nixon D. 2009. *Barriers to electronic medical records (EMR) adoption by selected primary care physicians in arizona: A case study*. Capella University

NZ Telehealth Forum and Resource Centre. 2018. NZ Telehealth Resource Centre NZ Telehealth Forum and Resource Centre

Obstfelder A, Engeseth K, Wynn R. 2007. Characteristics of successfully implemented telemedical applications. *Implementation science : IS* 2: 25

Ochieng O, Hosoi R. 2005. Factors influencing diffusion of electronic medical records: A case stud y in three health care institutions in Japan. *Health Information Management* 34: 120-29

Pettigrew A. 1987. Context and Action in the Transformation of the Firm (cited in Antwi and Kale). *Journal of Management Studies* 24: 649-70

Picker Institute. 1987. Picker Principles of Patient-Centered Care. Picker Institute

Poynter M, Hamblin R, Shuker C, Cincotta J. 2017. Quality improvement: no quality without equity?, Health Quality & Safety Comission New Zealand, Wellington

Price M, Williamson D, McCandless R, Mueller M, Gregoski M, et al. 2013. Hispanic migrant farm workers' attitudes toward mobile phone-based telehealth for management of chronic health conditions. *Journal of medical Internet research* 15

Protti D, Bowden T, Johansen I. 2009. Adoption of information technology in primary care physician offices in New Zealand and Denmark, part 5: final comparisons. *Informatics in Primary Care* 17: 17–22

Robert G, Greenhalgh T, MacFarlane F, Peacock R. 2010. Adopting and assimilating new non-pharmaceutical technologies into health care: a systematic review. *Journal of health services research & policy* 15: 243-50

Robinson J, Callister L, Berry J, Dearing K. 2008. Patient-centered care and adherence: Definitions and applications to improve outcomes. *Journal of the American Academy of Nurse Practitioners* 20: 600-07

Shaller D. 2007. *Patient-centered care: What does it take?* : Commonwealth Fund New York.

Speyer R, Denman D, Wilkes-Gillan S, Chen Y, Bogaardt H, et al. 2018. Effects of telehealth by allied health professionals and nurses in rural and remote areas: A systematic review and meta-analysis. *Journal of rehabilitation medicine* 50: 225-35

Standing C, Standing S, McDermott M, Gururajan R, Kiani Mavi R. 2016. The Paradoxes of Telehealth: a Review of the Literature 2000-2015. *Systems Research and Behavioral Science*

Swinglehurst D, Greenhalgh T, Roberts C. 2012. Computer templates in chronic disease management: ethnographic case study in general practice. *BMJ Open* 2

Talemaitoga A. 2010. The health of Pacific peoples in Aotearoa is “everybody’s business”. *Best Practice Journal* 32: 5-9

Taylor S, Pinnock H, Epiphaniou E, Pearce G, Parke H, et al. 2014. A rapid synthesis of the evidence on interventions supporting self-management for people with long-term conditions: PRISMS–Practical systematic Review of Self-Management Support for long-term conditions. *Health Serv Deliv Res* 2

Wade V, Eliott J. 2012. The role of the champion in telehealth service development: a qualitative analysis. *Journal of telemedicine and telecare* 18: 490-2

Wade V, Gray L, Carati C. 2017. Theoretical frameworks in telemedicine research. *Journal of telemedicine and telecare* 23: 181-87

Wade V, Taylor A, Kidd M, Carati C. 2016. Transitioning a home telehealth project into a sustainable, large-scale service: a qualitative study. *BMC health services research* 16: 183

Wade VA, Eliott JA, Hiller JE. 2014. Clinician acceptance is the key factor for sustainable telehealth services. *Qualitative health research* 24: 682-94

Walker J, Leveille S, Ngo L, Vodicka E, Darer J, et al. 2011. Inviting patients to read their doctors' notes: patients and doctors look ahead: patient and physician surveys. *Ann Intern Med* 155: 811-19

Walker J, Whetton S. 2002. The diffusion of innovation: Factors influencing the uptake of telehealth. *Journal of telemedicine and telecare* 8: 73-75

Ward A, Runcie E, Morris L. 2009. Embedding innovation: design thinking for small enterprises. *Journal of Business Strategy* 30: 78-84

Watson A. 2016. Impact of the digital age on transforming healthcare In *Healthcare Information Management Systems*, pp. 219-33. Switzerland: Springer

Weissman SM, Zellmer K, Gill N, Wham D. 2017. Implementing a Virtual Health Telemedicine Program in a Community Setting. *Journal of Genetic Counseling*: 1-3

Wenger E. 1998. *Communities of practice: Learning, meaning, and identity*. Cambridge University Press.

Wenger E, Trayner B, De Laat M. 2011. Promoting and assessing value creation in communities and networks: A conceptual framework. Rapport 18, Ruud de Moor Centrum, The Netherlands

Whitten P, Holtz B, Nguyen L. 2010. Keys to a successful and sustainable telemedicine program. *International Journal of Technology Assessment in Health Care* 26: 211-16

Whitten P, Love B. 2005. Patient and provider satisfaction with the use of telemedicine: Overview and rationale for cautious enthusiasm. *Journal of Postgraduate Medicine* 51: 294-300

World Health Organization. 1998. WHO Information Series on School Health: document four. Healthy nutrition: An essential element of a health-promoting school, World Health Organization, Geneva

Young J, Badowski M. 2017. Telehealth: Increasing Access to High Quality Care by Expanding the Role of Technology in Correctional Medicine. *Journal of clinical medicine* 6: 20

Zanaboni P, Wootton R. 2012. Adoption of telemedicine: from pilot stage to routine delivery. *BMC Medical Informatics and Decision Making* 12