Reimagining a better healthcare system through virtual care

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EXECUTIVE SUMMARY

"Up until 2020, it has been an ingrained part of Australian culture to receive healthcare in a face-to-face setting and in the provider's rooms or clinic. **The COVID-19 pandemic is an unprecedented culture interloper.**It will shift our culture in many ways, not least in our societal expectations and understanding of how we receive healthcare. We believe that virtual care has an important role to play in the future of healthcare delivery in Australia: "right care, right place, right time"[1].

Australia needs a vision for an **information and technology enabled** healthcare system, where care is more virtualised and enabled where it is needed, rather than where it is available. This is a system where clinicians and patients can communicate more effectively and one in which the clinical process is centered on the **needs of the patient**, rather than based on the availability of services. Most importantly, it is an environment in which the individual is better engaged and supported in their journey to wellness.

Australia's healthcare system is one of the best in the world, providing safe and affordable healthcare for all Australians. COVID-19 has forced the healthcare system to rapidly adopt technologies and telehealth practices in response to social isolation requirements and the highly infectious nature of this disease. In most cases telehealth is simply transferring what used to happen in person, such as a consultation, to an online format, to create a short-term workaround. However, stop-gap solutions mean the patient experience can be poor, unengaging, and sessions may be insecure, and data potentially compromised.

During the current pandemic it is the technology, and not the medical interaction and advice, that has become the focus. Hence, there is an urgent need for the health sector to move away from telehealth to the broader concept of virtual care. This is where a wider range of healthcare activities can be virtualised and digitised, such as remote monitoring, screening, pathology, and so on.

Australian healthcare needs innovation, and virtual care is one powerful modernisation that does not require dramatic disruption to our existing systems. Virtual care does not replace traditional models of care – it enhances, improves, and complements existing care.

Australia has made a substantial investment in its physical healthcare infrastructure, with emerging interoperability and information-enabled capabilities in the acute and primary care sectors. What is missing in these capabilities is how information resources can be connected to the clinicians and patients and how the information is accessed, shared and coordinated, to deliver healthcare that is constructed around the needs of the patient whilst maximising the use of existing resources. It is these capabilities that sit at the centre of creating a virtual care environment, one that is more patient centred, and creates a more productive healthcare system.

An effective virtual care environment demands new and comprehensive solutions that integrate and blend technologies to improve the experience for both patients and healthcare providers. These solutions need to be scalable, interoperable, and use secure infrastructure. More than this, they need to incorporate how patients and providers can use these solutions, integrated into clinical and care processes, as well as make effective use of existing technology. What is needed is a longer-term perspective to improve clinical care models, improve patient experience and patient outcomes, reduce costs, and improve patient safety.

This paper delivers three insights:

1 A recognition of the industry-wide problem facing Australian healthcare when delivering comprehensive, personalized care at a distance. Importantly, the implications of not addressing this problem.

2 The virtual care solution space and technological opportunity is used to create a framework of what is needed to realise sustainable and effective virtual care in Australia. This is supported by real use-cases that have saved lives and connected families with dying loved ones and demonstrates what is possible.

3 Recommendations for becoming a world-leader in virtual care. These recommendations will guide Australia to create a virtual care environment to deliver cost effective, enhanced, and personalised care for the medium and long term.

The key recommendations to improve patient care in Australia using information and technology-enabled virtual care are broadly directed to two categories - national policy and healthcare industry actions:

National policy:

1. Develop a national roadmap that supports adoption of virtual care across all Australian healthcare sectors. This roadmap will promote the use of digital health tools to collect information to enable personalised healthcare, improve patient safety and health outcomes.

2. Undertake national leadership in a multi-stakeholder strategy group to support patient-centred care through virtual care. This stakeholder group will comprise multi-disciplinary healthcare specialists, industry, technology experts, security advisors, and patients. The group will advocate for a refocus away from "technology" to "meaningful patient engagement" to better understand patients' needs.

3. Offer grants to promote digital health innovation.

4. Increase government and the healthcare sector engagement with the technology sector to boost digital health innovation. This will enable increased industry innovation in virtual care by developing policy that facilitates integration across healthcare sectors.

5. Initiate collaboration between government, healthcare, and technology industries to define a framework to protect the security and privacy of patient data to deliver safe virtual care.

6. Initiate a national review of standards to support and enable virtual care. The review will result in identification of existing standards and assess the need to develop new standards. This will lead to promotion in the use of standards to create interoperable, safe and secure virtual care solutions.

7. Improve adoption of virtual care through research funding into the efficacy of remote monitoring and wearable device collected data to support patient-centred healthcare decision making and patient outcomes. Ultimately this will help the introduction of outcomes-based funding models.

8. Strengthen support for virtual care delivery by a review of funding models across all sectors of healthcare.

Healthcare industry:

1. Prepare for strategic adoption of virtual care delivery. This will include preparation for immediate adoption of virtual care solutions to meet current demand and future planning for changes in healthcare delivery models. Incorporate virtual care to support improvement in patient-centred approaches to care delivery. It is vitally important to improve accessibility and the patient experience through delivery of care when and where it is needed.

2. Ensure virtual care solutions are selected carefully to meet Australian interoperability requirements and are compliant with Australian standards and regulation. Solutions should have embedded processes to support patient-centred care and improve the coordination of care rather than simply meeting organisational driven delivery requirements.

3. Inform and upskill the healthcare workforce to deliver effective virtual care services to ensure improved coordination of care and support the change in practice and shift in culture that new technology and new models of care involve.

4. Promote the use of new technologies, such as augmented reality (AR) and virtual reality (VR), through educating healthcare providers, to better inform future healthcare workers, and enable them to adjust to modern and progressive technologies.

5. Invest in infrastructure to support the use and innovation in virtual care. This will drive medium to long term efficiencies in the healthcare sector and productivity savings for both clinicians and patients.

6. Create an Australian virtual care index that can assess the readiness of healthcare providers, patients, and all levels of government to embrace virtual care. This index to be modelled on the US telehealth index and Cisco digital readiness index.

INTRODUCTION

The goal of virtual care is to provide better access to healthcare and improve patient outcomes whilst simultaneously controlling healthcare expenses [2, 3]. The COVID-19 crisis has been the catalyst to fast-track technology-enabled care, delivered remotely [4]. The change in clinical practice overnight has demonstrated that the industry can be flexible to its adoption.

The healthcare industry is notoriously slow to adopt and adapt to new technologies, and whilst telehealth has been with us in Australia for some time, particularly for remote healthcare, it is vastly underutilised and not encouraged by our healthcare funding models.Indeed, health jurisdictions have established Virtual Care Clinical Communities of Practice, in response to the pandemic, recognising the need for a multidisciplinary approach to virtual care delivery [5]. This multidisciplinary approach must include not only the multidisciplinary clinical team, but patients, carers, digital health experts and technology providers. Keeping patients out of hospital, facilitating primary care and frontline medicine whilst protecting healthcare providers and enabling quarantined healthcare providers, has been vital in 2020 and will continue to be in the future.

This white paper provides an authoritative, in depth report intended to inform Federal, and State and Territory Governments about virtual care. It combines expert knowledge and research that argues for the adoption of virtual care in Australia and makes recommendations for achieving this goal. The objective is to both inform and make recommendations that may drive national policy for a future using virtual care.

This white paper views virtual care through a wide lens by considering how to deliver continuity of care outside of acute care environments, e.g. at home, in aged care facilities, and through primary care providers. It provides insight into the problem of delivering complete and individualised healthcare to all Australians. This white paper defines what virtual care is and what it is not, what is driving the need for virtual care, and what are the ramifications of not addressing this problem.

Further, this white paper describes the solution space and technological opportunity, how to harness existing infrastructure, what new skills may be required, and what frameworks and guidance are needed to realise sustainable and effective virtual care in Australia. Using real use-cases, the white paper demonstrates successful uses of virtual care in Australia. These use cases have saved lives, connected families with dying loved ones, improved outcomes and reduced costs, and demonstrate what is possible. Finally, recommendations for how to move forward with virtual care in Australia are offered.

Providing a solid foundation for understanding and educating on virtual care in the Australian context, this white paper is based on facts and evidence. It advocates that virtual care is the way of the future for Australian healthcare. It offers a practical framework and advanced technical perspective on solving some of the biggest pain points in our healthcare systems and can be used to support development of national policy. Coming at a time that is particularly challenging for Australia and the world, this paper focuses on the issues at hand and importantly the new solutions that will be needed to accommodate a changing healthcare environment. Ultimately, this paper will aid in solving Australia's biggest healthcare challenges and create a new perspective on what is possible for the future.

AN INDUSTRY-WIDE PROBLEM

Australia's healthcare system and individual healthcare providers have been forced to respond quickly during the COVID-19 crisis to maintain continuity of care. These were anticipated to be short-term arrangements, rapidly and haphazardly deployed. Whilst the recent COVID-19 health emergency has accelerated the adoption of remote care, this implementation has been reactive and was not able to be well thought out.

What is evident is that our healthcare system is under stress in ways it never expected to be, and Australia was underprepared. Australia's healthcare system continues to grapple with significant challenges. Whilst many creative interventions have been deployed to counteract poor patient outcomes associated with these challenges, a shift in focus is needed to address these pain points.
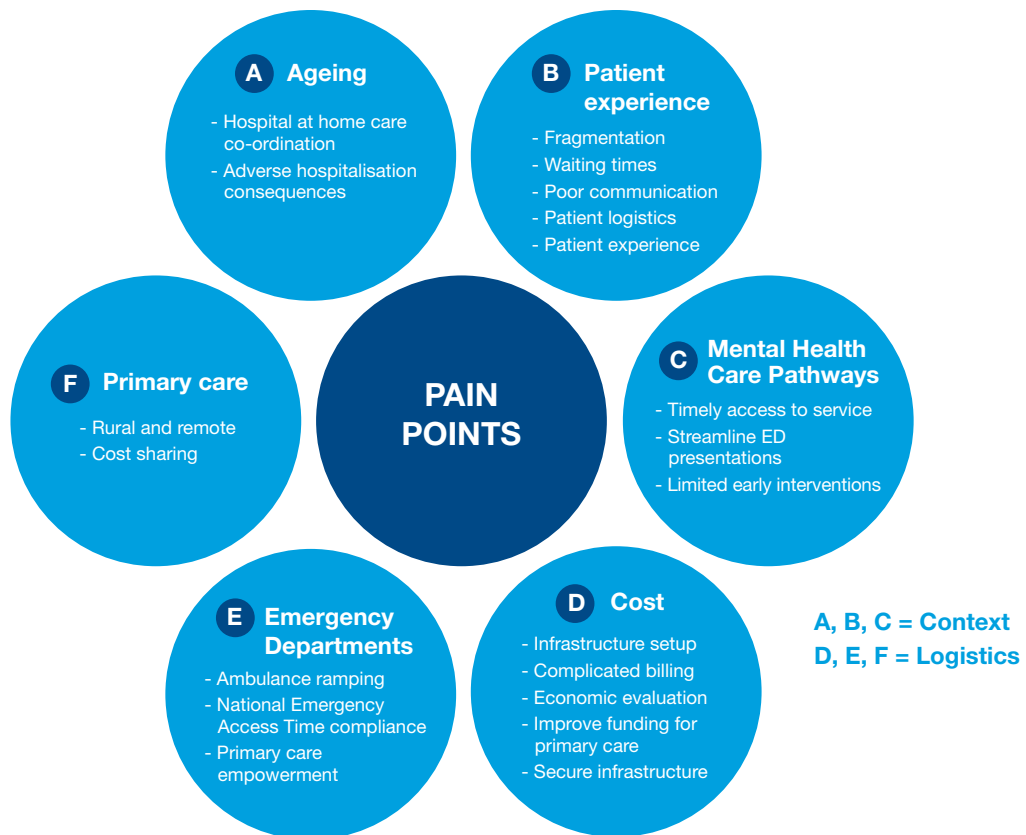
Recurring Government Pain Points

A shift in philosophy to address the recurring healthcare pain points, presents opportunities to embrace virtual care beyond what is currently perceived. By finding innovative ideas to urgently address the six major challenges facing Australian healthcare today (as shown in Figure 1), the contextual and logistical pain points can begin to be tackled.

The six major pain points to address are:

A The ageing population will create an overwhelming demand on Australia's healthcare resources, particularly in acute care, such that capacity to provide appropriate and optimal care will be exhausted.

B Around the world and in Australia, the trend is towards a patient-centred model where healthcare meets the demand and expectations of patients as they take more responsibility for their well-being. The current healthcare model is fragmented and inefficient and does not facilitate patient-centred care.

C When it comes to the treatment of mental health, the current healthcare model in Australia is inefficient and results in unnecessary high demand on acute and non-acute care.

D To address the escalating costs of funding public health, efficiencies that produce better healthcare outcomes are required both in acute and primary care settings.

E Emergency Departments are fraught with extensive waiting times that put patients at risk and cause undue stress on healthcare workers.

F The geographic nature of Australia makes healthcare in regional and remote communities more expensive and at times inaccessible, resulting in poorer patient outcomes.

Figure 1: Context = A-C and Logistics = D-F

Figure 1. Australia's recurring healthcare challenges

A **Ageing**
- Hospital at home care co-ordination
- Adverse hospitalisation consequences

B **Patient experience**
- Fragmentation
- Waiting times
- Poor communication
- Patient logistics
- Patient experience

F **Primary care**
- Rural and remote
- Cost sharing

PAIN POINTS

C **Mental Health Care Pathways**
- Timely access to service
- Streamline ED presentations
- Limited early interventions

E **Emergency Departments**
- Ambulance ramping
- National Emergency Access Time compliance
- Primary care empowerment

D **Cost**
- Infrastructure setup
- Complicated billing
- Economic evaluation
- Improve funding for primary care
- Secure infrastructure

A, B, C = Context
D, E, F = Logistics

A – Ageing

An increasingly ageing population in Australia has resulted in a demand for more effective healthcare systems [6]. It is well known that older adults are the most frequent users of hospital and other healthcare services. Hospitalisation not only compromises overall patient outcomes, caused by events such as adverse drug reactions and infections which increases patient length of stay, but it is a costly exercise for the patient and the government [7, 8]. This burden coupled with the changing age distribution, increased life expectancy and associated age-related illness, necessitates a re-focus on efficiencies and delivery of high-quality care rather than trying to curtail the demand for healthcare and aged care services [9].

B – Fragmentation across continuum of care

As patients navigate the healthcare system by moving from one healthcare provider to another, and from one healthcare service provision to another, the patient is the only one who experiences the journey from start to end. In recent years, issues such as excessive waiting times caused by poor logistics along the continuum of care, has plagued this experience.

Healthcare has changed in recent years, with more focus on meeting the healthcare expectations of patients, their families and carers. Over time there has been a move from patient to consumer and the embedding of processes to support patient-centred care, rather than focusing on organisational driven healthcare delivery [10]. There is an expectation of easier access to healthcare, and faster and more efficient services that are personalised to the individual [10]. Indeed, medical research already suggests a richer and more comprehensive patient care encounter is needed if primary care teams are going to provide better quality care to more patients. Finding efficient and effective systems to support this integration can be challenging in a fragmented healthcare system.

C – Mental Health

Another key problem area for the acute sector is the management of mental health patients. Mental health patients have longer wait times in emergency departments than other patients and are more likely to present after-hours. They often require more time in respect to their 'stabilisation' and to complete investigations compared to other patients, prior to their discharge to home or to in-patient wards [11]. Given that almost one-third of presentations are current patients of mental health services and the majority present 'after hours', it suggests that there may be a need for increased community-based nursing services [11] and innovative approaches for early intervention.

D – Costs

The Australian healthcare funding model is complex in nature, funded by all levels of Australian government – federal, state and territory, and local. In acute care, funding is an Activity Based Funding model used to pay for a typical care pathway and hospital length of stay per diagnoses, with penalties imposed for non-conformity in patient outcomes. In Australia, the total spend on health is 10% of GDP. In 2017-2018 this was $185.4b, with hospitals consuming 40% of the spend and primary care 34% Of this, the Australian Government contributed $77.1b, with $49.5b coming from the states and territories, and the $30.6b remainder funded by individuals, private health insurance providers and compensation insurers [12]. By 2022-2023, the government contribution is projected to be $89.5b [13].

E – Emergency Departments

Whether as a patient in an acute care setting or receiving care at a primary care level, waiting times are a key issue for healthcare, with hospitals under pressure to meet National Emergency Access Target (NEAT) [14]. The rise of COVID-19 has not diminished the normal demand for the healthcare system to manage chronic diseases and emergency situations. During the pandemic, there needs to be a continued focus to keep people with chronic illness and comorbidities healthy and out of acute care settings.

F – Primary Care

There is an ongoing need to improve poor health outcomes in rural and remote communities in Australia through improved access to healthcare services. Often isolated rural and remote communities are too small to support traditional models of healthcare delivery locally, so residents must access care from larger urban centres. Unfortunately, access to healthcare services provided in larger centres remains a problem for many residents of isolated settlements [15].

Impact of not addressing the problems

These fundamental problems in Australia's healthcare system cannot be ignored. The effect of moving too slowly means that healthcare costs will continue to escalate, and patient outcomes may be compromised by a shortage of resources, in a system that will struggle to meet demand. Patient-focused care demands a better patient experience that can only be met by reducing fragmentation across the continuum of care and creating better connected and information assisted care encounters.

The responsibilities of entities in the healthcare system would not fundamentally change with the inclusion of virtual care as an addition to existing care. Virtual care represents the best opportunity to:

- Improve healthcare efficiency;
- Increase healthcare productivity;
- Rein in the continuing escalation of healthcare costs;
- Meet increasing demands by balancing the shortage and uneven distribution of skilled healthcare workers;
- Improve patient outcomes and reduce adverse risks; and
- Improve patient experience and increase patient satisfaction.

These problems (Figure 1) create increased vulnerabilities in our healthcare systems that current solutions do not adequately address.

VIRTUAL CARE

Virtual care is the delivery of healthcare over a distance using various forms of communication and information technologies [16, 17], and where traditional face-to-face care delivery is complemented with information and technology enabled remote care. It can improve patient outcomes and constrain the ever-increasing costs of healthcare.

Virtual Care can improve our healthcare system – that is the "organisation of people, institutions, and resources that deliver healthcare services to meet the healthcare needs of people"[3]. Virtual care may be from clinician to patient, patient to mobile technology or healthcare provider to healthcare provider. Hence, virtual care is a broad term for all the digital tools and real-time communication, to enable healthcare providers to remotely work together with the patient.

What is virtual care

It can be said that the term "virtual care" is an umbrella [18] for a wide variety of terms that are used to describe the various ways and means that healthcare may be provided from a distance.

Virtual care encompasses the most commonly used terms:

Telehealth - the use of telecommunication techniques for the purpose of providing telemedicine, medical education and health education over distance [19, 20]

Telemedicine – the use of advanced telecommunication technologies to exchange health information and provide healthcare services across geographic, time, social and cultural barriers [19, 21]

Virtual care is **information and technology enabled** and can occur across the care continuum or may only focus on improving throughput on certain aspects of care provision along the care continuum. For example, a practice in primary care managing geriatric frail patients post hospital discharge may chose a virtual care model across the care pathway where the entire patient care is managed remotely. Or a hybrid model may be adopted where some aspects of the care pathway are managed remotely. Virtual care has the potential for cost saving and increased efficiency of care provision for the clinician and will enable similar benefits for the patient.

Why we need virtual care

Virtual care aims to improve patient outcomes by using digital tools to connect healthcare providers and patients, and facilitate access to information to accurately deliver healthcare capabilities where they are needed, when they are needed, with a focus on affordability.

A report by the Grattan Institute [22], highlights that Australian healthcare will have to change to support broader out-of-hospital care and new alternatives for primary care delivery. However, the most urgent need is the infrastructure, funding and process structures to support these changes. This includes the recognition of the limitations of current telehealth methods, addressing the barriers to virtual care and a focus on the drivers for its development and use.

Figure 2 gives a broad outline of the factors and context driving the need for virtual care. The rise of chronic disease and an ageing population, coupled with the difficulty in constraining the costs of treatment, are major reasons for seeking innovative solutions to maintain and improve our healthcare system. In addition, the low level of patient engagement in their own care (fostered by a traditional and paternalistic healthcare culture) needs to be addressed as we move to value-based, patient-centered healthcare.

The initial response to this problem, and one that creates the foundation for the delivery of effective virtual care, is the technology that can assist in solving these problems. This includes the underlying infrastructure and processes needed to enable a virtual environment, the use of digital health applications and data analytics, with the technologies and devices required for clinicians and patients as part of the information systems and data needed to support clinical decisions and improve patient outcomes.

Figure 2. Technology response and care drivers for virtual care.
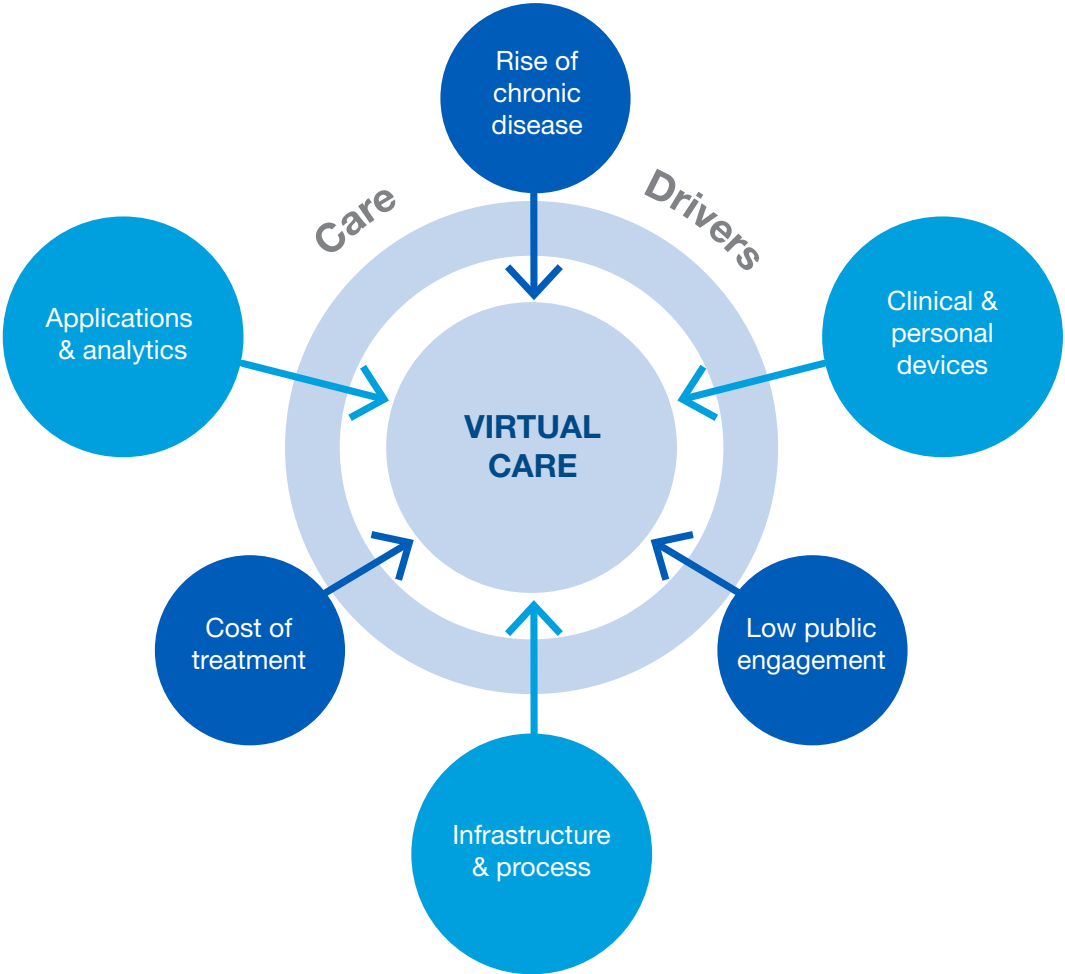
How virtual care can address the recurring government pain points

Virtual care presents the opportunity to address the six major recurring healthcare challenges that face Australia today (from Figure 1).

> A - The ageing population will create an overwhelming demand on Australia's healthcare resources, particularly in acute care, such that capacity to provide appropriate and optimal care will be exhausted.

Current coordination of hospital-at-home care could be strengthened by innovation in virtual care delivery. Utilising models of care that offer continuous care from start to end for patients, in their own home, rather than post discharge would benefit patients. Indeed, support should be provided to allow the development and implementation of virtual care models to remotely monitor and assess patients at home [23], particularly in situations of pandemics where patients who do not require acute or intensive care are advised to self-isolate and recuperate in their homes.

> B - Around the world and in Australia, the current trend is towards a patient-centred model where healthcare meets the demand and expectations of patients as they take more responsibility for their well-being. The current healthcare model is fragmented and inefficient and does not facilitate patient-centred care.

Analysis of patient experience measures has been part of healthcare service review for a number of years and has begun to shift from a distinct measure of satisfaction into encapsulation of the journey of patient experience [24]. Indeed, patient experience is increasingly associated with quality healthcare. Studies have found positive associations between patient experience and improved health outcomes, often as a result of improved healthcare delivery processes [25-29].

A key factor in patient experience is the quality and quantity of communication to allow patients to have a greater involvement in their own care decisions. This is essential to developing trust, self-efficacy, adherence to treatment and recovery protocols, and is associated with improved health [30, 31]. Fragmentation across care pathways is common and compounds the problems in communication.

Hence, it is the development of secure and scalable digital infrastructure that is the foundation for a coherent patient journey by facilitating an increasingly connected and integrated healthcare system. The challenge is in how to create a more connected healthcare environment in which the patient-centred and consumer focused experience can be better facilitated and supported – virtual care is one tool that can address this.

Future developments of virtual clinics may also consider different methods of delivery, such as video conferencing, and whether they might be targeted at specific groups of complex patients including those with complex comorbidities (severe mental illness), advanced complications (renal disease) and the older frail population [32].

> C - When it comes to the treatment of mental health, the current healthcare model in Australia is inefficient and results in unnecessary high demand on acute and non-acute care.

Virtual care provision may assist in decreasing the proportion of patients presenting to emergency departments and their associated prolonged stay. Reconceptualising mental health care models goes beyond delivering services via telehealth alone; it requires mental health professionals to embrace smart digital technology for early intervention outside acute care, so on-demand care can be offered before an adverse event. This is particularly important given that there is insufficient funding for community-based services and it is quite common for the community mental health services to direct patients to the emergency department rather than to community services [33, 34].

> D - To address the escalating costs of funding public health, efficiencies that produce better healthcare outcomes are required both in acute and primary care settings.

Virtual care service provision, enabling care outside acute care settings, will drive innovation in Australia's complex healthcare environment and associated funding model. Cost savings can be realised by keeping patients out of hospital. Funding can be diverted to virtual care options thereby improving primary care funding and by extending the Medicare Benefit Scheme (MBS) support for allied health professionals.

The Federal Government has responded quickly to the pandemic by establishing a new MBS funding arrangement, a hotline for triaging suspected COVID-19 cases and an online symptom checker. The new MBS funding arrangement for virtual care supports the use of technology to assess and triage patients who are suspected to have, or are at high risk for COVID-19 [23].

Private health insurer reimbursement continues to be important, particularly with a continued focus on wellness and prevention. The extras cover provided by private health insurers (physiotherapy, dietetics, chiropractor, osteopath, mental health services, and occupational therapy) play an important part in primary prevention. Some of these services can effectively be provided over virtual channels as has been demonstrated during the COVID-19 crisis.

Telehealth services in rural Australia have been supported by the MBS for psychiatry since 2003, for specialist services since 2011, and for rural general practice services since 2019. In response to the COVID-19 pandemic, the Australian Government extended the funding for telehealth services to consultations between patients and their general practitioners (GPs), mental health service providers and medical specialists, and to midwives. It is now considering how telehealth can be used by any healthcare provider, including allied health, in the future.

The opportunity to investigate how virtual care could impact costs of the healthcare system in Australia is a vital piece in improving patient outcomes whatever the drivers, be they patient demand, pandemics, or embracing new care pathways enabled by technology. Added to this, maintaining world-class, safe and affordable healthcare for all Australians means we need to look for new and alternative information and technology enabled ways to shift, rather than transform, healthcare in Australia.

> **E.** Emergency Departments are fraught with extensive waiting times that put patients at risk and cause undue stress on healthcare workers.

Enabling virtual care assessment and management of low acuity patients and devising innovative ways to empower primary care physicians to keep patients out of acute care would reduce emergency department presentations, waiting times, and ambulance ramping [35].

Coupled with the current need for social distancing, public and private funding models need to expand to fund doctors, nurses, and allied health professionals to deliver care virtually, where clinically appropriate. These measures will support people who require medical care, who may have high levels of anxiety due to the crisis, to seek treatment and care as well as help to prevent transmission of the disease through the healthcare workforce [23].

> **F.** The geographic nature of Australia makes healthcare in regional and remote communities more expensive and at times inaccessible, resulting in poorer patient outcomes.

The time is ripe to build upon the significant achievements in relation to innovative models in primary care since the first National Rural Health Strategy [15]. Virtual care is a vital component to addressing this issue. Whilst telehealth and telemedicine have been widely used in Australia over the past decade as a means of overcoming problems of access to healthcare and the shortage of healthcare professionals in rural and remote areas [36], in many cases, telemedicine and telehealth are used to augment other service delivery models [15]. There is a need for ensuring that a comprehensive range of well-coordinated primary healthcare services is locally accessible and virtual care should be part of the solution, particularly as the prevalence of chronic disease grows with the ageing of Australia's rural and remote population [15].

Perhaps the greatest impetus is to bridge the gap and provide more continuity between primary and acute care [37], to the benefit of the patient, their experience and to control healthcare spending costs. It is encouraging to see that the bulk billing schedule fees have been increased during the pandemic as a further incentive for clinicians to provide bulk billed services. This will support patients who may be experiencing high levels of anxiety to continue health-seeking behaviour, keeping Australians healthy and out of the hospital as the COVID-19 crisis continues [23].

Virtual care drivers

In addition to addressing the recurring government challenges, making better use of the technology we already have and extending telehealth, together with patient demand, are key drivers for virtual care. COVID-19 has also been a catalyst for exploring alternative healthcare delivery methods as well as an opportunity to facilitate more comprehensive patient-centered healthcare service delivery options.

Extending telehealth

Effective patient-centred care requires patient engagement, resource and care coordination, and a "new" patient-physician relationship [37]. The barriers that telehealth addresses, particularly for rural and remote areas, are a huge step in reducing the inequity in access to healthcare services [38]. However, where telehealth replaces the consultation element, it does not encompass a holistic experience for the patient. Whilst there are many types of telehealth condition specific services, there is no telehealth solution that aims to integrate the continuum of care or takes a complete perspective of the patient.

Since 2009 over 80 commercial telemedicine companies have entered the market [39], with the majority catering for low-acuity issues. Whilst the use of telehealth services was projected to increase in other countries, in Australia prior to COVID-19 less than 0.1% of MBS consultations were via teleconsultation. This is despite patient experience studies indicating high satisfaction with telemedicine [40].

> **A virtual care approach can address the following limitations of tele-methods:**
>
> **1** The need for adjunct services to [38]:
> - support telehealth
> - connect to local community services
> - expand the range of services that can be provided
>
> **2** The need to integrate across the continuum of care to:
> - give a complete and holistic perspective of the patient journey
> - go beyond one-to-one communication/consultation
> - connect commercial solutions and usual care pathways
> - connect primary care physicians and acute care

Patient demand

An increasingly powerful driver is the push for patients to take more responsibility for their own health and with this comes the demand for consumer and patient preference, expectations of convenience, lower costs from reduced travel and waiting [19, 41, 42].

Drivers as a response to COVID-19

In Australia, the acceleration in the use of physically separated healthcare encounters has been driven by the 2020 COVID-19 pandemic [1, 4, 43, 44], supported by MBS funding for telehealth consultations [1]. Virtual care models are needed to assess and monitor patients at home who do not need acute care services. We have evidence that this use of virtual care works: in far north NSW, Armidale Hospital has commenced a pilot program for patients with moderate symptoms of the virus. The patient cohort is sent home with ICU-grade home monitors to continuously track their vital signs (heart rate, temperature, oxygen saturation, blood pressure and breathing) 24 hours a day. Artificial Intelligence (AI) then supports clinicians to detect early deterioration of a patient's vitals [23].

As the current pandemic unfolded, we have seen a proportion of the frontline healthcare workforce self-quarantined, due to exposure or travel restrictions. Some of this quarantined workforce will be asymptomatic or have very mild symptoms and will still be able to work virtually. These quarantined workers should be used to provide virtual triaging or monitoring of at-home COVID-19 patients. Interoperability and security issues will need to be considered to enable this workforce to work remotely and provide healthcare to others [23].

The recent COVID-19 pandemic demonstrates the need for virtual care tools, including telemedicine, remote patient monitoring and essentially real-time communications between patient and healthcare providers – to evaluate, triage, treat and care for patients. This is virtual care. Beyond the COVID-19 demand, patients want access to virtual care services. An overwhelming number of Australians would take advantage of virtual care services but only 12% have experienced it along with very few doctors [45, 46]. Many patient studies demonstrate "satisfaction" with a virtual care experience [40].

Government Policy

The transformational opportunities that digital technology can facilitate in healthcare depends on "the degree of system interoperability: the ability to share information across time and space from multiple devices, sources and organisations" [47].

The healthcare industry is slow to facilitate the efficient exchange or sharing of patient and medical data between electronic record systems. It means that vital statistics about a patient's state of health cannot be "gathered, transmitted or used" [48]. Sharing the latest accurate information about the health of a patient between attending and consulting physicians and other healthcare workers improves outcomes [49-51]. The industry manufacturers of medical devices and electronic medical records protect their markets by locking healthcare providers into their proprietary systems. Yet, we need commercial innovations to reduce costs, drive value-based care, and improve patient outcomes [44, 45, 52].

In Australia, where healthcare is largely government funded, the government is in a strong position to mandate that industry healthcare systems follow stringent and secure standards to facilitate data integration, interoperability, and security. At the same time, healthcare providers have a responsibility to demand that system providers put the "needs of clinicians and patients first" [48]. Government policy geared toward motivating healthcare providers to replace legacy systems with technology solutions that facilitate interoperability will accelerate virtual care and target lower costs [39].

In FY18, 80% (95,000) of MBS funded GP services were consultations of less than 20 minutes. A significant proportion of these attendances, such as repeat prescriptions, referral renewals, and some follow ups not requiring examination are deemed appropriate for a virtual care consultation. There is evidence of equal or improved health outcomes when care, where clinically appropriate, is delivered through virtual channels. Care through virtual models is also related to higher patient satisfaction and patient cost savings, such as time and money to travel to appointments. Therefore, MBS funding should expand to fund the integration of virtual care consultations into clinical practice. The government could also explore capitated or outcomes-based funding models, which would also encourage use of virtual care as a complement to face-to-face visits [23].

Challenging what is holding us back

Adoption of digital health tools, such as virtual care, is challenging because of a fragmented healthcare delivery system, integration into workflow, issues around security and privacy, trust, and job security [3, 53]. In addition, the adoption of new models of care are influenced by the value proposition, the type of technology, how the healthcare system is organised, a resistence to workflow changes, and regulatory complexity [3]. Further, there is a lag between technology developments and application to healthcare [16]. Another major hurdle is the slow pace at which the healthcare industry changes [4]. There is a reluctance by practitioners to adopt new technology and to develop the skills required for the virtual world. In Australia, 27.2% of practitioners are 55 or older [54]. Another barrier to the adoption of virtual care is geographic [55]. Healthcare providers are generally licensed and regulated in one jurisdiction and may not be licensed to provide services in another location where they are most needed.

"In Australia, where healthcare is largely government funded, the government is in a strong position to mandate that industry healthcare systems follow stringent and secure standards to facilitate data integration, interoperability, and security."

THE OPPORTUNITY

There is no framework for how to move forward with virtual care in a comprehensive manner in Australia [16, 40]. Without an inclusive and all-encompassing framework for understanding what virtual care is, the facets it comprises, its challenges and what benefits it can realise, it is not possible to innovate and devise solutions that meet the changing and competing demands in Australian healthcare.

This becomes a powerful driver for investigating the strategic, tactical and operational necessities for the future of patient-centred care.

A conceptual framework for virtual care

For virtual care to succeed the following enablers are needed:

- supportive policy and funding incorporating cooperation between the Commonwealth and States and Territories;
- readiness of the community and profession with a skilled and informed workforce;
- infrastructure interoperability and data integration; and
- solid leadership and governance.

Therefore, a comprehensive virtual care framework needs the **combination and integration of technology with processes and policy, interoperability between information systems, interface between people and data,** as shown in Figure 3. For true virtual care, these three aspects must work together and cannot be considered in isolation.

Figure 3. Virtual care solution components
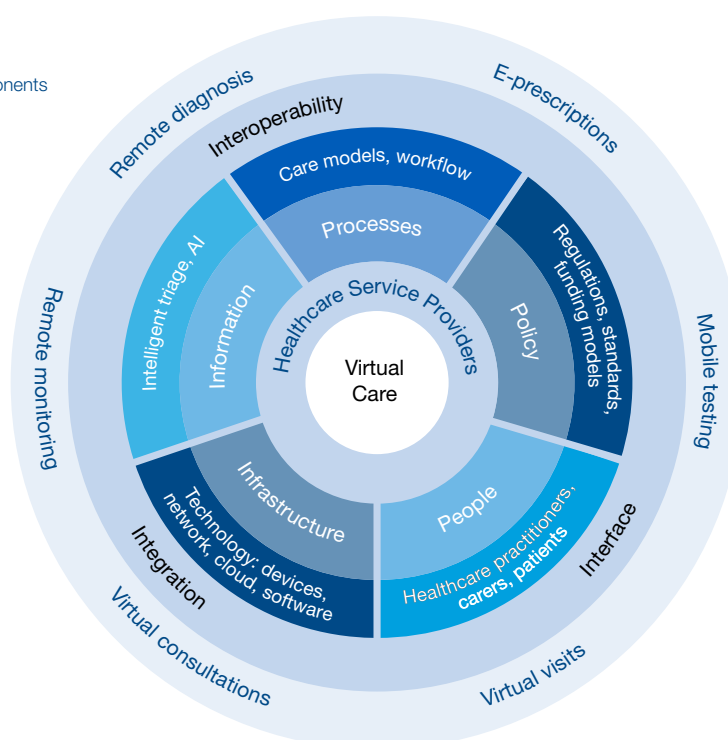
Virtual Care is provided by Healthcare Service Providers:

Virtual care services are:

1 Composed of the **Interface** between **People**

    i. People refers to anyone who is involved in the healthcare ecosystem, from *Patients to carers,* and any type of *Healthcare practitioner*, provider or professional.

2 Facilitated through **Interoperability**

    i. Interoperability is the **Integration** of **Information** systems, **Processes**, and **Infrastructure** to enable the secure exchange and use of healthcare information.

    ii. Information is any data recorded or transmitted in the process of delivering healthcare, and its processing may include *Intelligent triage and AI*; and

    iii. Infrastructure is the *technology* components required to deliver the healthcare services. This includes *hardware, software, devices, network resources, cloud architectures* and so on.

    iv. Processes are the procedures related to delivering healthcare and include *Care models, Workflow,* and care pathways.

3 Supported by **Policy**

    i. Policy includes *Governance, Standards, and Funding models*.

Examples of virtual care components include *Remote Monitoring, Remote Diagnosis, E-Prescriptions, Mobile Testing, Virtual Visits, and Virtual Consultations.*

People

The interface between all actors in healthcare is a vital component in providing the best care to patients. The virtual care solution must effectively leverage the skills of all individuals in the care team for a patient, including the patient. This is a teaming approach to care delivery, which can be supported by coordinating technologies. Further, to optimise the patient experience and focus on the needs of the patient, a seamless flow of communication and information is required. This means that the environment of care can be a blend of local and virtual.

"a medical virtualist specialty may be necessary"

Skills or experience

To support virtual care and embrace digital health, educating the workforce will be a key component. Enhanced skills will be needed to adapt to virtual care. Prior to the COVID19 crisis, very few Australian doctors had any experience with telehealth [56]. Any change in practice or shift in culture that new technology and new models of care involve, are sometimes difficult for humans to adapt to. Yet many of these are merely adaption to advancing healthcare methods. For instance, new skills and competency for healthcare providers to deliver non face-to-face care, creating a medical virtualist specialty may be necessary [37, 57, 58]. This involves not only refined skills in communication but challenges the hands-on nature and culture of traditional care [57]. A conservative and slow to change medical culture is challenged by potential risks in separation of clinicians [37], a preoccupation with the technology [58], together with fears of how to establish an effective relationship with patients [57]. This necessitates a shift in attitude. Development of new methods of building relationships and community may also be required. This is not new as the world, particularly the younger generation, embrace technology for communication, relationship development and work.

New technology

New technology capabilities to assist the human interface includes the use of augmented reality (AR) and virtual reality (VR) during consultations. This could provide a much richer experience for both the patient and healthcare provider. To date AR and VR have been used in healthcare for training and practice [59]. VR allows clinicians higher quality simulation, planning, and patient stage mapping, as well as enhancing the capabilities for interventional radiologists during diagnostics and therapy, leading to improved patient outcomes [60].

Process

One of the greatest challenges to virtual care is a lack of interoperable infrastructure, integrated with process [46]. A simple but perfect example involves the process of getting a prescription. A patient may experience the convenience of a telehealth visit but then has to visit the clinic to collect a prescription [46]. Another example is the use of sensors and wearables to collect continuous data however the data does not flow to the doctor [58]. There is also the question of an appropriate toolset and training that enables clinicians to cope with the influx of data [39]. This highlights the added issue of integration of data, say from devices, into clinical process that creates useful information for patient diagnosis and treatment.

Infrastructure

Digital transformation in healthcare is no small task. It involves sophisticated use of information enabled by digital infrastructure and technology, aligned to healthcare business objectives. Understanding the capabilities of the healthcare provider organisation is vital.

There are tools to assess existing capabilities of infrastructure and to provide an incremental pathway for practical adoption of virtual care. Cisco developed an infrastructure maturity assessment framework to assess and guide an organisation's capabilities through their digital infrastructure [61]. This framework characterises the technology services required to support information driven processes. This framework was subsequently adopted by the Healthcare Information and Management Systems Society (HIMSS) to become the international benchmark as the HIMSS Analytics Infrastructure Adoption Model (INFRAM).

"Digital hospitals need to take advantage of the technologies that can improve information use and flow and to meet quality clinical and administrative outcomes. The necessity for the technology infrastructure to support these outcomes is clear. Yet such infrastructure is complex and continually evolving in its design and deployment" [61].

The legacy systems used by clinics and practitioners continue to be an issue, particularly where they operate proprietary systems architecture, operating systems and software. As we have seen in recent years this is not only an issue with interoperability but an increasing security problem [53, 62, 63]. The use of benchmarking tools like INFRAM, will help providers move forward to limit the issue of legacy systems.

Another important aspect is the security of information systems and the infrastructure that supports them. Whilst the security of information is well understood, the security of infrastructure, particularly wireless, is often poorly considered. Wireless technologies have undergone a rapid evolution and become a constituent part of communication solutions for most healthcare provider environments replacing the traditional cabled communication. The dependence on this technology is rapidly increasing given its adaptive and flexible nature. The safe deployment of a wireless network involves a resilient infrastructure with maximum availability supported and balanced with effective cybersecurity protection and ongoing monitoring. However, there is a lack of recognition of the gravity that poorly designed and secured wireless infrastructure can have on patient safety, interruption to day-to-day operations and clinical process. Cisco, together with Flinders University, developed the Healthcare Safe Wireless Framework that provides a practical, and systematic approach to the design and development of safe and secure wireless networks [64]. This protection framework will enable designers and implementers of wireless networks to employ informed, best, and relevant industry practice, and this is particularly important as we move to Wi-Fi 6 and incorporate health Internet of Things (IoT) devices into patient and healthcare provider networks.

Information

There is no doubt that improved clinical and business processes are often driven through enhancing the information flows which support them. Understanding how information is used, integrated into process and workflow, and how information systems interoperate, requires a clear understanding of the capabilities of an organisation's information technology infrastructure.

There is a massive opportunity to enhance health outcomes for chronic disease and prevention using medical-grade devices, as consumers increasingly adopt activity trackers and fitness devices. This is driven by IoT and increasing consumer acceptance of these technologies, coupled with the desire for convenience and more personalised care. This opportunity also addresses a known problem where clinic visits are poorly suited to treatment of chronic disease as they assess only a single point in time measurement, such as blood pressure. The inclusion of continuous variables over time are more meaningful rather than a single point in time measure [58]. The challenge is how to integrate device and monitoring technology, including wearables used by patients, with the healthcare providers' processes, care models and funding sources, including government and health insurance companies. Individual care and funding models to promote prevention as well as treat chronic conditions using devices including IoT sensors and wearable collected data currently do not fit into our care delivery models. There is no incentive for clinicians to proactively monitor and manage such data. Indeed, the pain point is analysis and triage of this data, and integration into existing electronic records systems as well as security concerns, as has been well described in the context of mobile healthcare for many years [65]. A revised focus on value-based care models, which are associated with patient outcomes may be the momentum that drives better use of activity monitors and IoT technology.

An important factor is trust in the data collected. Non-medical device trackers are not validated currently by regulators however, international standards addressing this issue are in development to document quality and efficacy. Despite this, consumers are taking more control of their lifestyle though adoption of these devices.

Policy

Virtual care must incorporate privacy and security, safety and quality, standards of care, patient engagement, and continuity of care policies. There is a need for policy, standards, and guidance on virtual care technologies and how to efficiently, safely, securely and cost effectively implement them. The US Consumer Technology Association acknowledged this need in the 2020 Guiding Principles for Virtual Care [66] and international standards bodies recognise the need for greater preparation for major challenges in healthcare:

"COVID-19 is not the first global pandemic, and it won't be the last. Global healthcare will continue to be an ever-changing environment where we must anticipate and address the next seismic shift. We're prepared to ensure our standards are there to support these changes." Ulrike Kreysa, Current Chair, Joint Initiative Council Senior Vice President, GS1 Healthcare [67]

Governance in the healthcare sector encompasses a wide range of policy making related activities undertaken by government to meet national health policy objectives. This includes regulatory compliance and funding. There is an opportunity to build on existing initiatives, such as the Australian Government free video calls for GPs (until the end of September 2020), to assist in creating new business models for primary care for the post-pandemic environment. This recognises that healthcare provision will move towards a blended model for care delivery [68].

Examples of virtual care components

There are many components that can comprise virtual care. The most common examples include:

- Remote monitoring allows monitoring patient's condition outside traditional clinical settings, for instance while at home or in a care facility. Remote monitoring can reduce patient admissions to hospitals. Examples of monitoring include kiosk instruments, medical-grade digital devices such as thermometers, pulse oximeters, blood pressure cuffs, stethoscopes, continuous glucose monitoring, remote electrocardiogram, and remote ultrasound.

- Remote diagnosis is based on a patient's condition as a result of remote monitoring, performing check-ups outside the traditional clinical setup to diagnose any abnormalities using, for instance, measuring vital signs or providing eye imaging.

- E-prescriptions allows prescribing, dispensing, and claiming medications without a paper prescription.

- Mobile testing labs provide onsite medical lab testing facilities during emergencies or specific situations. This enables the provision of quick and cost-effective services when and where needed and can eliminate capacity issues in acute care.

- Virtual visits are currently specific initiatives such as TeleICU, TeleNICU, and TeleStroke.

- Virtual consultations are consultations between patient and a healthcare service provider over a distance using a technological media, as has been seen during the COVID-19 crisis.

Practical application of information and technology-enabled virtual care

The translation of the virtual care solution components (as defined in Figure 3) necessitates leveraging both technology and information. With the needs of the patient the focal point, blending local and virtual communication, using a team-based approach to ensure process and information flow to create an environment that maximises health outcomes for the patient, and empowers them to have more engagement and input into with their experience.

Figure 4. Information backbone structure
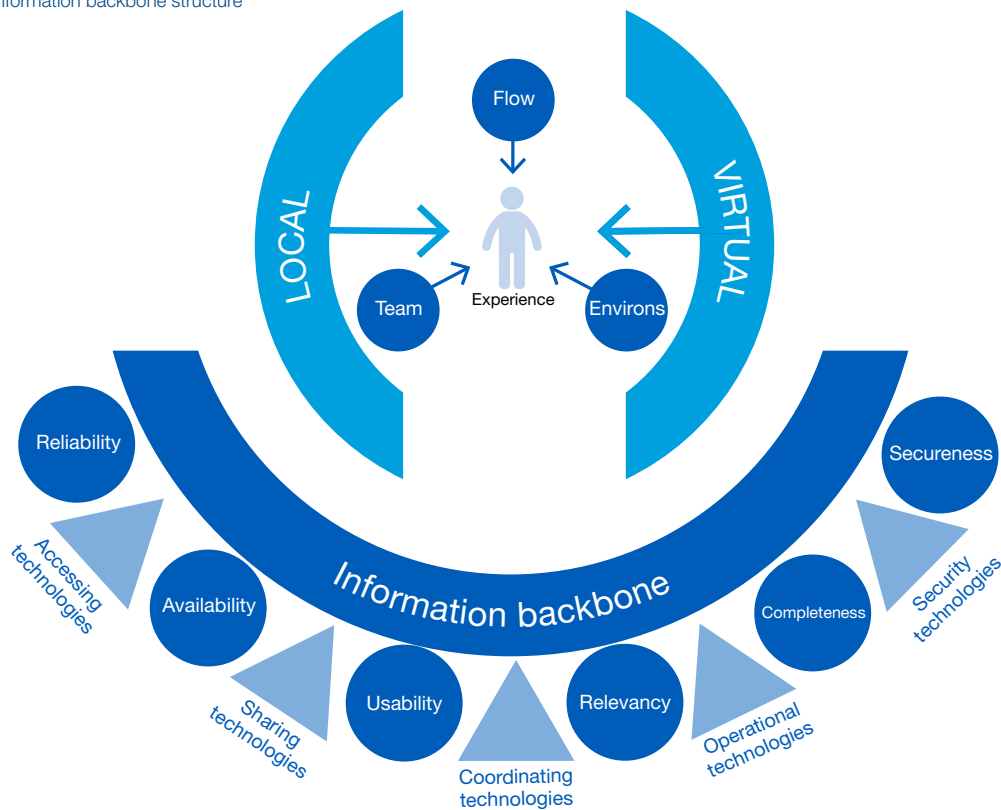
The link between the delivery of quality virtual care and the information and technologies required to support them, is known as the information backbone (Figure 4). This information backbone supports and facilitates the patient experience, linking local and virtual care delivery through coordination of care teams, information and process flow, and the environment.

The information backbone is defined as two components: (1) a set of integrated technologies that support the interface, integration, and interoperability functions and (2) the information attributes:

1 The integrated technologies are accessing, sharing, coordinating, operational and security technologies (displayed as triangles); and

2 The information attributes are reliability, availability, usability, relevancy, completeness, and secureness (displayed as circles).

Accessing technologies	Being able to access information where it is needed, on a device appropriate for the information being consumed, the skills of the person consuming the information, and the task at hand.
Sharing technologies	Once accessed, information needs to be shared to enable clinical decision making, and for patient support. This information needs to be shared in a manner which is simple to engage with, and in line with the models for sharing, common to the broader consumer environment.
Coordinating technologies	Once the information is accessed and shared, and a decision is made on the next step in the healthcare process, from which the healthcare providers and patients need the ability to engage with the clinical process to influence the way care is delivered.
Operational technologies	It is critical that the information backbone is constructed in such a way that it is easy and cost effective to maintain and evolve as the needs of the community mature.
Security technologies	In the current cybersecurity environment, it is critical that security is part of the information system fabric, seamlessly integrated from the end points through to the cloud services, and is constantly monitored and updated in real time as threats appear.

The information attributes describe the qualities of the information delivered by the backbone technologies:

- **Reliability:** Information is available whenever it is required.

- **Availability:** Information is available wherever it is required.

- **Usability:** Information is delivered on/in an appropriate device/format.

- **Relevancy:** It is the information required for the task at hand.

- **Completeness:** Information contains all the context required for decision making.

- **Secureness:** The information process is protected.

The components of this information backbone enable a virtual care ecosystem that is patient-centred and sustainable, providing the optimum experience for the patient and the care team. The impact of information flow, delivering the right information at the right time and place, to make the best possible decisions for the patient, is critical to improving both health outcomes and consequently controlling costs.

The development of digital infrastructure to create the information backbone is critical. Information and communications technology have a central role in enabling more effective clinical and operational care processes. It does this by creating the interface between people, by making use the interoperability of infrastructure, and by integrating data into processes, when and where it is needed. The information attributes are key governance, quality and effective use of the information.

Industry already has the components that make up and support this information backbone and many have been deployed during the COVID-19 crisis. For instance, one coordinating technology is the Cisco intelligent Contact Centre [69]. The COVID-19 pandemic created an unprecedented demand and adoption for contact centre capabilities in Australian hospitals. The combined need to manage omnichannel communications through phones, online portals and internal information systems creates an enormous challenge in serving both the exploding patient demand, but also the demands from clinicians and healthcare workers practicing in very challenging environments, both within and external to their current hospital facilities.

WHAT IS POSSIBLE - CASE STUDIES

These case studies provide a snapshot of what an information and technology-enabled healthcare system can look like. These provide examples of care that is more virtualised and facilitated where it is needed rather than where it is available. These use cases are across the spectrum of healthcare providers.

Wollongong ICU

Environment:

Wollongong Hospital's Intensive Care Unit (ICU) cares for the most critically ill patients. With the advent of COVID-19, Wollongong ICU recognised the important need for families to see and talk to their loved ones in ICU, in some cases for the last time and a final farewell. Rapidly creating more capacity, ICU now has 63 fully ventilated COVID beds and a total of 84 ICU beds.
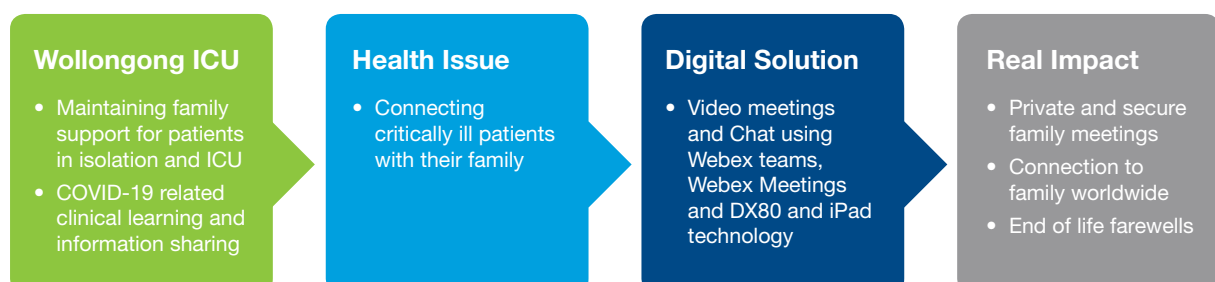
Health Issue:

The need to keep patients isolated, and staff and families safe, meant highly restricted visiting and only essential staff in ICU was necessary during COVID-19.

Digital Solution:

Through a collaboration between Cisco, Taleka, and Citrus, the digital answer that solved this issue uses video meetings and chat using Cisco Webex teams, Cisco Webex Meetings and Cisco DX80 and iPad technologies.

Real Impact:

Development of the *HowRU Connecting patients and family* solution to overcome the isolation restrictions and facilitating secure, direct, and private communication between the patient and their family. The real impact of this is a human approach and connection to loved ones during restricted visiting and unfortunately in some cases, end of life situations. With family across the world as well as locally, families have felt connected even though they cannot physically be at the bedside, and patients have had family members 'virtually' there for support when making difficult healthcare decisions. The demonstration of the digital solution capability also enables the hospital to protect staff and patient during COVID-19. Using the same technology enables clinicians and nurses to remotely monitor in-patients without visiting a patient's bedside. Further, this provides an opportunity to better connect staff for information sharing and learning about the situation. Importantly, the hospital is looking at bringing in expertise clinical consultants at critical times to support the staff in the ward through the technology.

Wollongong ICU	Health Issue	Digital Solution	Real Impact
• Maintaining family support for patients in isolation and ICU • COVID-19 related clinical learning and information sharing	• Connecting critically ill patients with their family	• Video meetings and Chat using Webex teams, Webex Meetings and DX80 and iPad technology	• Private and secure family meetings • Connection to family worldwide • End of life farewells

SA Health - Virtual visits for rehabilitation at home

Environment:

The program started in 2015 initially to reduce the length of stay for in-patients needing rehabilitation. Patients could be sent home earlier and continue their rehabilitation in the comfort of their home. In 2017 the program went state-wide and patients can enrol in the program directly as well as part of their discharge from hospital.

Health Issue:

Support recovery through telehealth and provide patients with an earlier discharge from hospital, facilitated by providing in-home rehabilitation services for conditions including recovery post trauma, stroke, amputation, and reconditioning, and to support the statewide spinal and brain injury services.
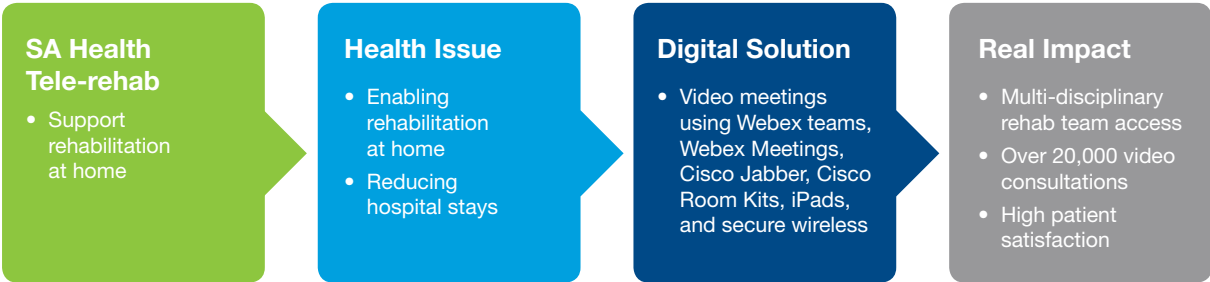
Digital Solution:

SA Health loans patients an iPad with Cisco Jabber or provides Cisco Webex Teams for those with their own devices. Clinician initiated video meetings use Webex teams, Webex Meetings, Cisco Room Kits and secure Cisco Wireless technology.

Real Impact:

Statewide Telerehabilitation enables consumers accessing SA Health rehabilitation services to access all, or part, of their rehabilitation from their own home and community. Consumers' use videoconferencing with the full multidisciplinary rehabilitation team (medical, nursing, allied health, and assistant staff) to address their individual rehabilitation goals. Consumers and clinicians have access to a comprehensive library of therapeutic applications that can be used during therapy sessions or for access between sessions to enhance therapy goal attainment. Patients report high levels of satisfaction with the model which reduces travel time, expenses and fatigue for consumers and their support network and enables therapy to take place in the consumer's own environment. In the financial year 2018-2019 more than 6,400 video consultations were provided to rehabilitation consumers across the state with more than 14,200 consultations in 2019-2020. The program enables individuals to consult with doctors / clinicians from anywhere.

Over 75% of consumers believe they receive the same standard of care from a video consultation and more than 80% would happily participate in video consultations in the future. This program has also led to the establishment of an early management of mild to moderate brain injury service using telerehabilitation as the standard model of service delivery to consumers.

SA Health Tele-rehab

- Support rehabilitation at home

Health Issue

- Enabling rehabilitation at home
- Reducing hospital stays

Digital Solution

- Video meetings using Webex teams, Webex Meetings, Cisco Jabber, Cisco Room Kits, iPads, and secure wireless

Real Impact

- Multi-disciplinary rehab team access
- Over 20,000 video consultations
- High patient satisfaction

Monash Health

Environment:

Monash Health is Victoria's largest public health service, providing high-quality healthcare to one-quarter of Melbourne's population across the entire lifespan – from pre-birth to end-of-life. With over 16,000 employees at over 40 care locations across south eastern Melbourne, Monash Health provides more than 4.1 million episodes of care each year. This includes in excess of 265,000 admissions to their hospitals, over 63,000 responses to ambulance arrivals, and more than 46,000 surgical procedures performed annually.

Health Issue:

Providing effective and efficient care for patients whilst the clinical, nursing and administrative staff are scattered across services and locations, and working from home to reduce number of staff on-site or whilst in isolation during COVID-19. Further, to accommodate individual communication preferences (video, messaging, voice calling), and to create a virtual mechanism to maintain collaboration with external partners, suppliers, vendors and other healthcare specialists during the pandemic.
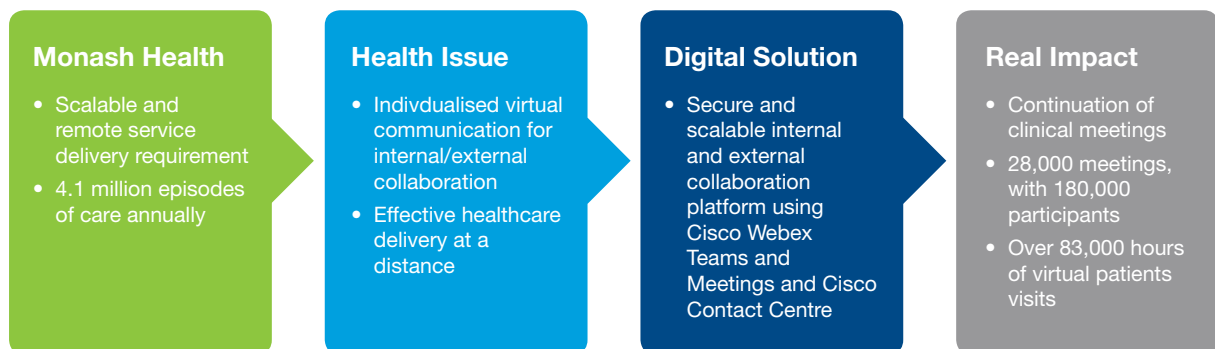
Digital Solution:

A virtualized and unified internal and external collaboration platform, which is secure and scalable using Cisco Webex teams, Cisco Webex Meetings, and Cisco Contact Centre.

Real Impact:

This scalable solution has enabled the organisation to have 'all staff' virtual meeting, with the CEO and senior executives. This was not possible previously. Staff are able to work from home whilst continuing clinical meetings virtually. In addition, they realised the important opportunity for nursing training and for delivery of IT support from anywhere. In March/April 2020 there were over 83,000 hours of virtual visits, 28,000 meetings involving 140,000 participants.

This successful outcome has stimulated the increased adoption of virtual care at Monash Health, with plans to expand to a family and patient connection program to enable post operation check-in and virtual check-ins as a response to restricted visiting hours; remote patient appointments to eliminate travel for staff and patients and reduce the risk of transmission from patients visiting hospitals; remote and fracture clinics for gerontology in the Loddon Melli region; after hours psychiatry consults alleviating the need for travel in the Eastern region; allow translators to be available remotely for consults with the deaf and hearing impaired; collaboration across health agencies to facilitate sharing secondary specialists resources on demand; and immersive EMR and clinical technology training in theatre and operating suites though remote observation.

Monash Health	Health Issue	Digital Solution	Real Impact
• Scalable and remote service delivery requirement • 4.1 million episodes of care annually	• Indivdualised virtual communication for internal/external collaboration • Effective healthcare delivery at a distance	• Secure and scalable internal and external collaboration platform using Cisco Webex Teams and Meetings and Cisco Contact Centre	• Continuation of clinical meetings • 28,000 meetings, with 180,000 participants • Over 83,000 hours of virtual patients visits

St John of God

Environment:

St John of God Healthcare is a national private healthcare provider operating over 27 hospitals comprising of 3500 beds and over 14,500 employees across Australia. The organisation needed access to digital collaboration technology to enable seamless communication between staff during a period in which staff were being asked to work from home. Support for large outreach services program was vital.

Health Issue:

The issues were two-fold: to facilitate improved coordination and support for staff to work from home, enabling remote project management, support for operational services and enabling corporate communications; and supporting the key clinical workflows outside of elective surgery, to deliver on duty of care for outreach services for outpatient services, and social outreach services including mental health services, drug and alcohol outreach, and education courses for new parents.

Digital Solution:

A secure and compliant platform using Cisco Webex teams, Cisco Webex Meetings, Cisco Voice platform, accessible on any device.
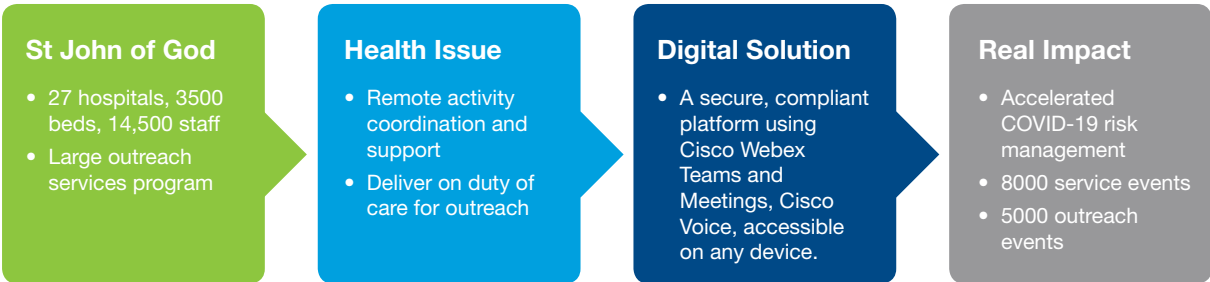
Real Impact:

The digital solution enabled all-hands meetings, where the CEO and other executives could bring together all staff virtually, keeping staff in touch and fully informed. Importantly, St John of God Healthcare's core patient cohort are the same profile as those who are most at risk from COVID-19. Therefore, the ongoing treatment of these patients in a virtual manner allowed them to address the risks to their ongoing health. In addition, whilst the organization had already been using Cisco Webex for virtual meeting capabilities, the COVID-19 situation brought a requirement for a number of new use cases to be supported. The digital solution solved this challenge with its ability to be scaled quickly, provide a secure environment with the ability to protect users and data, and support for different workflows and rapid adoption by clinical and administrative staff, as well as by patients as consumers.

In March/April 2020, 3000 service events delivered over Webex, 8000 service events delivered via telephone using the Cisco voice platform and over 5000 Social outreach events.

"Clinicians were able to deliver social outreach services with very comparable results to face to face. Clinicians believe this virtualised care option allowed them to be more agile and provide greater service reach to SJOGHC. Patient feedback was positive as they preferred not having to come to hospital for the appointment" - St John of God Healthcare Program team.

There are plans to move from telehealth as a 'response' to virtualised care as a platform, and integrate patient administration, clinical records, and scheduling into a patient portal. Investigation is underway to expand clinical service for virtual consultations in allied health, patient monitoring, in home care, patient education and create a visiting medical officer (VMO) initiative to allow clinicians from across St John of God Healthcare to connect and collaborate with other providers. The digital platform will also assist administrative expansion where clinical and non-clinical staff can participate in training sessions from anywhere, facilitate Town Hall style executive forums and deliver VMO and stakeholder events.

St John of God	Health Issue	Digital Solution	Real Impact
• 27 hospitals, 3500 beds, 14,500 staff • Large outreach services program	• Remote activity coordination and support • Deliver on duty of care for outreach	• A secure, compliant platform using Cisco Webex Teams and Meetings, Cisco Voice, accessible on any device.	• Accelerated COVID-19 risk management • 8000 service events • 5000 outreach events

Selected overseas virtual care examples

Mental Health Program

Most primary and specialty care clinics do not have access to a full team of professionals to address the mental health needs of their older adult patients, much less co-located services. The US based BRIGHTEN Program (Bridging Resources of an Interdisciplinary Geriatric Health Team via Electronic Networking) is an innovative solution to this problem. The primary care provider works directly with the clinics, and virtual team members do not need to be geographically located in the same area as the patient or the practice. Provider resources are used efficiently, allowing for many patients to receive recommendations with minimal commitment from virtual team members and clinic staff. With guidance from program developers, the BRIGHTEN Program could be replicated and implemented in primary or specialty care clinics across the country. Rural clinics may be able to partner with larger medical centers in urban areas for virtual team creation or use community providers who may be interested in joining the virtual team to increase patient referral [70].

Primary Care

Maple, a Canadian company, connects Canadian patients with online licensed physicians through phone, tablet, or computer technology. During the COVID-19 crisis, Maple is providing all people in the Province of Ontario with provincially funded online screening. The company is providing the platform free of charge for any Canadian physician who requires a virtual care platform to see their own patients. Where virtual care is not funded by provincial governments, Canada's largest pharmacy chain, Shoppers Drug Mart, has agreed to fund online physician consults at no cost to patients. Companies such as Lemonaid in the US provide a seamless process to treat medical conditions. Lemonaid simply requires an online questionnaire to be filled out with the patient's health history, then a doctor reviews the information with some follow-up questions. Medications are sent directly to pharmacies with delivery in 2-3 business days [23].

Hospital at home

Development and implementation of virtual care models to remotely monitor and assess patients at home is being seen across the world. For instance, in Singapore, a telehealth app called MaNaDr is being used to remotely monitor COVID-19 patients in their homes. Connection with patients by healthcare providers is initiated daily to review the patient's self-assessed symptoms and if a patient deteriorates, an ambulance is called. This reduces the demand for hospital care, reduce potential infections, and encourages patients to recover at home [23].

New models of care

Patients have an expectation of how care should be delivered and will increasingly expect virtual care options to supplement in-person attendances. These models of care are common in healthcare systems in the US and the UK. For example, Babylon, founded in 2013 in the UK, is approved by the UK's NHS to serve as an official primary care provider. It has an AI system that understands symptoms entered by the patient and provides relevant health and triage information. The patient is then connected to a network of healthcare providers available 24/7 with prescriptions delivered and instant access to clinical records. Health reports and monitoring by syncing health data from IoT devices make the service information-enabled [71].

> These use cases and new models of care demonstrate the capability to improve many aspects of healthcare: access to care; patient and provider experiences; and the productivity and efficiency of the healthcare system using virtual care.

BENEFITS REALISATION

It is clear that virtual care has benefits for the patient, healthcare providers, healthcare services, and the healthcare system.

Virtual care delivers real benefits:

- Better patient safety and health outcomes;
- Improves accessibility and patient experience through delivery of care when and where it is needed;
- Drives medium to long term efficiencies in the healthcare sector and productivity savings for both clinicians and patients;
- Highlights the risks associated with current arrangements; and
- Creates a clear and compelling vision for what a post-COVID-19 environment should look like.

Virtual care provides benefits to patients when embracing patient-centred care approaches, particularly for routine treatment of chronic conditions [37, 58] and this is supported by the increasing set of digital services and health monitoring that can be performed at home [4, 44]. Virtual care that combines remote monitoring with teleconsulting provides more comprehensive, efficient and effective methods of triage and treatment for chronic diseases that require continuous management [58, 72]. This leads to healthcare delivered more conveniently for the patient, often eliminating travel time and costs and minimising waiting times. Also, of considerable benefit to the patient, is the ability to include multiple healthcare providers, allied health providers and family and carers in one consultation. This encapsulates a more personalised and proactive approach to care for the patient, thus improving the experience and outcomes. Virtual visits efficiently provide more information about a patient's "living conditions" and overall situation than can ever be effectively assessed at the clinic.

As one-third of Australian's population live outside major cities, in small unserviceable pockets of rural and remote communities, the challenges of distance and economic disadvantage indicate that healthcare delivery in these communities requires a different delivery model [15]. The primary benefits of virtual care are the reduction of costs and patient accessibility to healthcare together with improved outcomes. In some ways, the cost of medical care is the classic economic dilemma of supply and demand. There may not be a shortage of resources, but the resources are located in the wrong place [55]. Virtual care can address these problems.

Virtual care has the potential to reform healthcare as it is practiced today, providing patient-centred care with more convenience, less costs and greater productivity [18, 73]. Virtual consultations are more efficient [74]. This frees up clinicians for more serious non-routine care [58], and as seen in the COVID-19 crisis can ameliorate for short-term increased capacity [1], whilst also making use of unused time and see additional patients [55].

The future is using virtual, augmented, and extended reality for education, simulation and therapeutics in healthcare. Whilst more work is need to promote adoption and make these technologies standard care additions to complement patient care, the healthcare profession needs be open minded to what is possible using technology to enhance care [75].

In the context of the COVID-19 crisis, virtual care provides enormous benefit. It reduces the risk of spread [4]; protects the valuable healthcare service providers and the most vulnerable of patients. It reduces the demand for precious PPE supplies [46, 76] and increases the capacity of healthcare hotspots through the use of remotely located resources [1].

Australia leading the way

Australia has many virtual care pilot projects. For example, the CallADoc pilot in regional and remote Western Australia. In a location where doctors are transient and often difficult to recruit, the CallADoc pilot utilises Telsta's Virtual Doctor service providing patient access to doctors by telephone or video [77]. Among other benefits, it has freed up expensive emergency department resources and eliminated the need for patients to travel long distances, saving time and money.

Another exemplar of all-around improvements in healthcare using virtual care is in the area of neonatal and paediatric intensive care and specialist services. Studies show that Neonatal ICUs (NICU) improve the clinical outcomes [78] among infants and children. The use of a virtual intensive care nursery reduces the length of stay from 7 to 2 days, reducing costs and improving the quality of care and the education of parents [79]. In Australia, the Bush Babies project was the first virtual NICU providing access in rural and remote areas for critically ill and premature newborns. Providing real-time remote monitoring and videoconferencing capabilities, the Bush Babies project provided access to neonatal specialists.

A pilot of virtual radiology rounds in a NICU also proved to be popular with both the radiologists and the primary care team, improving patient care and the education of radiologists, while increasing integration with the care team [80].

Another innovative example of a pilot program of virtual care, that integrates digital health using an app, to integrate with clinical practice, is the Australian Physiotherapy Association (APA) trial electronically recording data on Patient Reported Outcome Measures (PROMs) in real-time from patients receiving physiotherapy treatment for knee conditions. The data is then used to assist in clinical decisions about treatment. This is adding a layer of information into existing clinical processes [81].

Enhancing the benefit

Whilst there are significant patient and healthcare provider logistical benefits, the ability to create a more **information and technology enabled** healthcare system is essential. This would provide care that is more virtualised and enabled where it is needed, rather than where it is available. It is a system where clinicians and patients can communicate more effectively and one in which clinical process is centered on the **needs of the patient**, rather than being driven by traditional healthcare delivery settings.

The changes in healthcare are occurring rapidly due to COVID-19. A focus on changes that deliver better access to information and targeting of services, treatment and care can deliver real, measurable and sustainable benefits for Australia. Cisco is at the heart of creating the opportunity for virtual care as it works with healthcare customers and partners to help them to securely grow, reduce costs and deliver better, faster and personalised patient experiences. This commitment from Cisco enables scalability and increased access and equity for healthcare services, through integrated, scalable, and secure infrastructure, whilst simultaneously creating a new narrative focused on experience, not technology.

RECOMMENDATIONS AND CALL TO ACTION

Australian healthcare needs innovation, and virtual care is one powerful modernisation that does not require dramatic disruption to our existing systems.

Whilst there are examples of successful initiatives such as patient web portals for access to patient and clinician personal health information, such as MyHealth Record, there are few examples, if any, of integrated and interoperable virtual care initiatives that put the patient as the centre of the continuum of care.

Australia is well placed to make use of the recommendations and results of the Canadian government led investigation into how to adopt virtual care [16] for primary and community care. Advocating a shift in dialogue away from "technology" to "meaningful patient engagement" to better understand patients' needs, as well as identifying the need for a strong conceptual framework for the meaningful use of technology were major outcomes. The role of government is to develop policy based on the vision of how to improve population health through virtual care. This is a complex task and requires action with regard to funding models, investment in interoperability of information and communications technology (ICT) systems, outcome measures to measure success, and significant engagement with patients to create improved patient -centred care and shift patients to be active participants in their own care.

The health sector needs to build and support sustainable partnerships between Australia's technology sector and providers to drive virtual care innovation. Australia must ensure a regulatory pathway that balances robustness with ease to support the adoption of new virtual care technologies. In addition, it is important to encourage innovative digital players to connect to MyHealth Record and other existing technologies that medical professionals use today. This will enable data and information to freely and securely flow [23].

A major finding of this white paper is that whilst there are pockets of virtual care innovation, there is no coordinated approach to its development, governance, and adoption. To create sustainable healthcare system innovation such as virtual care, requires support from all stakeholders: government, healthcare providers, healthcare funders, industry, and patients. In considering how to achieve this, using a technology-enabled and broad lens, this white paper delivers tangible recommendations for how to deliver continuity of care outside of acute care environments, using virtual care as a tool to contribute to a viable and cost effective healthcare system for Australia in the long term.

Recommendations

National policy:

1. Develop a national roadmap that supports adoption of virtual care across all Australian healthcare sectors. This roadmap will promote the use of digital health tools to collect information to enable personalised healthcare, improve patient safety and health outcomes.

2. Undertake national leadership in a multi-stakeholder strategy group to support patient-centred care through virtual care. This stakeholder group will comprise multi-disciplinary healthcare specialists, industry, technology experts, security advisors, and patients. The group will advocate for a refocus away from "technology" to "meaningful patient engagement" to better understand patients' needs.

3. Offer grants to promote digital health innovation.

4. Increase government and the healthcare sector engagement with the technology sector to boost digital health innovation. This will enable increased industry innovation in virtual care by developing policy that facilitates integration across healthcare sectors.

5. Initiate collaboration between government, healthcare, and technology industries to define a framework to protect the security and privacy of patient data to deliver safe virtual care.

6. Initiate a national review of standards to support and enable virtual care. The review will result in identification of existing standards and assess the need to develop new standards. This will lead to promotion in the use of standards to create interoperable, safe and secure virtual care solutions.

7. Improve adoption of virtual care through research funding into the efficacy of remote monitoring and wearable device collected data to support patient-centred healthcare decision making and patient outcomes. Ultimately this will help the introduction of outcomes-based funding models.

8. Strengthen support for virtual care delivery by a review of funding models across all sectors of healthcare.

Healthcare industry:

1. Prepare for strategic adoption of virtual care delivery. This will include preparation for immediate adoption of virtual care solutions to meet current demand and future planning for changes in healthcare delivery models. Incorporate virtual care to support improvement in patient-centred approaches to care delivery. It is vitally important to improve accessibility and the patient experience through delivery of care when and where it is needed.

2. Ensure virtual care solutions are selected carefully to meet Australian interoperability requirements and are compliant with Australian standards and regulation. Solutions should have embedded processes to support patient-centred care and improve the coordination of care rather than simply meeting organisational driven delivery requirements.

3. Inform and upskill the healthcare workforce to deliver effective virtual care services to ensure improved coordination of care and support the change in practice and shift in culture that new technology and new models of care involve.

4. Promote the use of new technologies, such as augmented reality (AR) and virtual reality (VR), through educating healthcare providers, to better inform future healthcare workers, and enable them to adjust to modern and progressive technologies.

5. Invest in infrastructure to support the use and innovation in virtual care. This will drive medium to long term efficiencies in the healthcare sector and productivity savings for both clinicians and patients.

6. Create an Australian virtual care index that can assess the readiness of healthcare providers, patients, and all levels of government to embrace virtual care. This index to be modelled on the US telehealth index and Cisco digital readiness index.

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