

Unlocking health innovation through balanced regulation

Reflections on value, risk-based regulation and the way forward for telemedicine in South Africa



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Introduction

Since the onset of the Covid-19 pandemic, public health systems around the world have been stretched to capacity. Globally, this has forced a re-evaluation of how people engage with health systems, and South Africa is no exception.

This report is the third and final contribution to the [No More Waiting Room series](#), which deals with the impact of Covid-19 on telemedicine in South Africa. The first provided an overview of the South African telemedicine sector and examined changes in this specific market since the advent of Covid-19. The second presented five detailed case studies on South African telemedicine providers to showcase the many ways in which telemedicine can be harnessed to increase access to quality healthcare.

This third report in the series builds on the content of the first two. It's a deeper reflection of how telemedicine can contribute practically to help achieve universal health coverage and improved access to quality affordable healthcare. It considers the potential implications of a lack of appropriate telemedicine regulation and proposes policy options to promote a more robust telemedicine market.

Telemedicine is not new to South Africa. In July 1998, the National Department of Health (NDoH) convened a task team to coordinate the phased introduction of telemedicine into healthcare service delivery in South Africa, and to develop the National Telemedicine Strategy.¹

Despite the project's bold and noble ambitions, the provision of equipment, and buy-in at the highest level within the NDoH, it didn't translate to a successful implementation at provincial level.

When it came to training, expertise and funding to implement telemedicine, provincial health departments were ill-equipped. Unfortunately, the National Telemedicine Project had failed by 2002.

Despite this failure, there are various examples of telemedicine being practiced in the South African public and private sector. This includes usage in teledermatology²; maternal health – in the form of MomConnect and NurseConnect³; neurosurgery and radiology⁴; as well as its applications being explored for traditional medicine.⁵

Telemedicine has also remained part of the NDoH's eHealth policy, which was guided by the SA eHealth strategy of 2012-2017 and the mHealth Strategy of 2015-2019.^{6,7} The eHealth strategy of 2012-2017 defined eHealth as the use of Information and Communication Technology (ICT) for health. This may include treating patients, pursuing research, education, disease tracking and monitoring in public health. Although this definition is very broad, the strategy explicitly states the importance of leveraging telemedicine to achieve the NDoH's aims through providing specialist care in remote, resource-poor settings.⁷

SECTION

1

How telemedicine can support the South African healthcare system

There are many ways in which telemedicine can optimise the delivery of healthcare services, and ultimately impact the wellbeing of the entire population. Table 1 and 2 show examples of demand- and supply-side pain points in healthcare delivery that are resolved by telemedicine, and specifically which existing telemedicine service providers address these issues.

The tables also show how each of these solutions can be leveraged to achieve broader NDoH policy objectives. The strategic objectives in the NDoH's Medium-Term Strategic Framework for 2019-2024 lays out four high-level goals of its health sector strategy for 2019-2024⁸: increase life expectancy by improving health and preventing disease; achieve Universal Health Coverage (UHC) by implementing the National Health Insurance (NHI) policy; quality improvement in the provision of healthcare; and building health infrastructure for effective service delivery. Telemedicine has the potential to support each of these goals both directly and indirectly.



“80-86% of health concerns can be resolved remotely without the need for an in-person consultation”

1.1 Telemedicine makes it cheaper for users to access healthcare

Accessing healthcare services at facilities is costly to patients in terms of both money and time. A study of the home delivery of chronic medication in South Africa estimated that patients spend approximately two to three and a half hours of their day travelling to healthcare facilities and accessing care; with patients in rural areas spending the most time travelling and waiting at facilities.⁹ The patients in this study spent approximately R45 on collecting medication at healthcare facilities.⁹

Telemedicine services give patients direct access to healthcare workers (HCWs) without having to travel. They also allow patients to be appropriately triaged so that fewer patients visit health facilities for ailments that can be resolved without in-person consultations. Data from Intercare and Allegra show that between 80-86% of health concerns can be resolved remotely without the need for an in-person consultation. These teleconsultations are also cheaper than face-to-face consultations.

These demand-side pain points and potential solutions are described in Table 1.

¹ For more information refer to the second report in the No More Waiting Room series, [Case Notes from the Frontier](#).

Table 1: Demand-side health system pain points and existing telemedicine solutions

PAIN POINTS IN ACCESSING HEALTHCARE SERVICES	EXISTING SOLUTIONS	NDOH STRATEGIC GOAL SUPPORTED BY THIS SOLUTION
<p>Financial costs of accessing in-person healthcare</p>	<p>Healthcare providers using digital platforms to reach patients enable patients to access care remotely, and potentially in the comfort of their own homes. Remote care allows the patient to avoid the costs of travelling and potentially missing work associated with accessing in-person healthcare.</p> <p>This remote care may take the form of consultations via telephone, video call, instant messaging chat, remote monitoring using wearable devices, and virtual scripting, among others.</p> <p>Providers who facilitate provider-to-provider (P2P) support enable task shifting to lower-cost HCWs. Subsequently, the cost of receiving a given level of care can drop. The nurse-led model is the highlight for addressing the stated pain point.</p> <p>Providers: HelloDoctor, The Counselling Hub, Intercare, Doctors on Call, Discovery DrConnect, Stone Three, Allegra, Healthbridge, Talamus*, CLICKDOC, Phulukisa, Healthforce and Quro</p>	<p>Achieve Universal Health Coverage (UHC): lowering the direct financial cost of accessing health services supports increasing access to health services and therefore universal health coverage.</p> <p>Increase life expectancy by improving health and preventing disease: reducing barriers to accessing health services is likely to increase health-seeking behaviour and improve health outcomes.</p>
<p>Inconvenience and time wastage associated with unnecessary visits to health facilities</p>	<p>Platforms that enable triage help patients to avoid unnecessary health facility visits and interactions with HCWs, especially during the Covid-19 pandemic.</p> <p>Providers: HelloDoctor, DrConnect, Kimi from Momentum and ThinkMD*</p>	<p>Achieve Universal Health Coverage (UHC): lowering the indirect cost of accessing health services supports in increasing access to health services, and therefore universal health coverage.</p>
<p>Patient experiences of shame or stigmas associated with accessing STI testing and reproductive health services</p>	<p>Many people fail to get STI tests, pregnancy tests or contraceptives due to the shame and stigmas associated with accessing these services. Providers that allow clients to request contraceptive prescriptions and order STI or pregnancy tests online will help clients to overcome these hurdles.</p> <p>Provider: GetTested</p>	<p>Increase life expectancy by improving health and preventing disease: reducing the stigmas associated with sexual and reproductive healthcare is likely to increase health-seeking behaviour, particularly among high-risk groups (e.g. men and very young mothers).</p>

* Service providers not interviewed as part of this study

1.2 Telemedicine makes it cheaper for providers to deliver healthcare

here are several ways in which telemedicine lowers costs for healthcare providers.¹⁰ The first is through more effective triaging. For example, Phulukisa provides community health workers (CHWs) with devices to collect patient biometrics which feeds into their AI-enabled algorithm that scores and risk-stratifies patients. After stratification, the CHWs can triage patients accordingly and decide whether patients need to visit a health facility or not. This process can potentially free up health workers to focus on patients who need care the most, particularly the most high-risk ones who tend to be the costliest to treat if they don't receive appropriate and timely care. In this way, telemedicine also enables the health system to be more responsive.

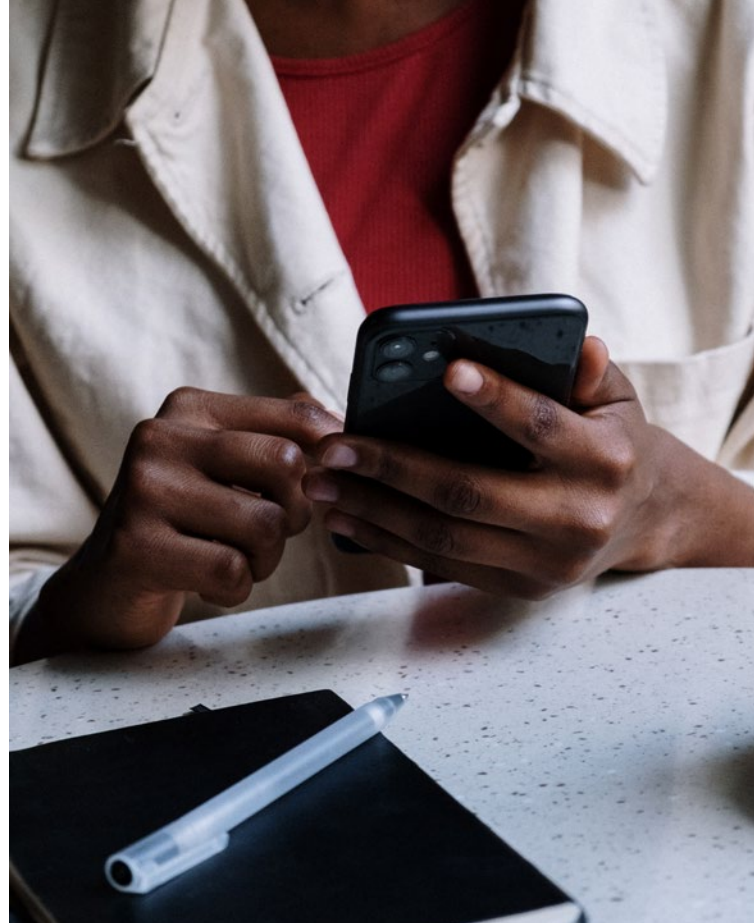


Table 2: Supply-side health system pain points and existing telemedicine solutions

PAIN POINTS IN ACCESSING HEALTHCARE SERVICES	EXISTING SOLUTIONS	NDOH STRATEGIC GOAL SUPPORTED BY THIS SOLUTION
<p>Unclear patient referral pathways</p>	<p>Platforms that enable patient-centred provider-to-provider (P2P) communication strengthen referral processes by allowing HCWs to discuss referrals with each other, and to share relevant patient information with the referral facility.</p> <p>Providers: Vula*, Talamus*, SystemOne*, ThinkMD* and Signapps</p>	<p>Quality improvement in the provision of healthcare: clearer referral pathways ensure that patients access appropriate care in a timely manner. The patient experience is therefore improved, and potentially, health outcomes may also improve</p>
<p>Lack of collaboration and continuity when managing patient cases</p>	<p>Platforms that enable P2P communication promote teamwork because HCWs can advise each other or co-manage patients.</p> <p>Providers: Signapps, eHealth Group and Vula*</p>	<p>Quality improvement in the provision of healthcare: improved communication between HCWs treating the same patient allows for more efficient case management and a “whole person”-approach to care, which may improve the patient experience and health outcomes.</p>

PAIN POINTS IN ACCESSING HEALTHCARE SERVICES	EXISTING SOLUTIONS	NDOH STRATEGIC GOAL SUPPORTED BY THIS SOLUTION
<p>Scarce human resources for health (HRH), particularly specialised resources</p>	<p>Platforms that facilitate P2P communication enable task shifting. This may expand the pool of resources and free up scarce specialist resources.</p> <p>Providers: Healthforce, eHealth Group, Phulukisa and Quro</p>	<p>Quality improvement in the provision of healthcare: digitally supported task shifting enables primary healthcare to be delivered using the lowest level of skills, without having to compromise on the quality of care.</p> <p>Achieve Universal Health Coverage (UHC): increased access to specialist care in rural or remote health facilities through task shifting ensures that patients receive the appropriate standard of care and accurate diagnoses, regardless of their location.</p>
<p>Provider challenges with tracking patients lost to follow-up</p>	<p>Digital tools that link patient diagnosis to patient treatment allows HCWs to track which patients haven't received treatment after a diagnosis.</p> <p>Provider: SystemOne*</p>	<p>Build health infrastructure for effective service delivery: moving towards the creation of a universal health record for all patients unlocks the potential for automated tracking of patients. This means that those that lost to follow-up can be welcomed back to treatment more swiftly.</p>
<p>High cost of in-hospital care</p>	<p>The use of technology to provide alternative ways to access in-patient care with fewer resources (such as more affordable HCWs or more affordable locations) may decrease costs, making care more accessible to those who need it.</p> <p>Provider: Quro</p>	<p>Build health infrastructure for effective service delivery: enabling patients to be monitored in the comfort of their homes or at lower-level hospital facilities reduces the burden on the health infrastructure, without compromising on the quality of care patients receive.</p> <p>Quality improvement in the provision of healthcare: the potential for patients to receive care in their homes or closer to their communities, without relying on extended stays in hospital, may have a positive effect on their health outcomes and quality of life, particularly for palliative care.</p>

* Service providers not interviewed as part of this study

1.3 Telemedicine can be leveraged to achieve broader health-policy objective

Improving health and preventing disease through community-oriented and preventative care

To improve access to services and promote patient-centred care, the NDoH is trying to incorporate more community-oriented primary care (COPC).^{8,11} The COPC approach brings health activities to the social environment. It's grounded in the belief that to achieve population- and individual-level improvements in health, the social determinants that shape health should be tackled simultaneously.¹¹

There's evidence that integrating the COPC approach with innovative telemedicine solutions could achieve a greater reach and increase the value of care provided to the population. A key example that highlights the effectiveness of telemedicine initiatives in the Sub-Saharan Africa context is LivingGoods. This initiative has deployed digitally empowered community health workers (CHWs) into

communities in Kenya and Uganda to diagnose specific issues related to maternal and child health, conduct TB surveillance, provide e-scripts and deliver certain medicines – such as oral contraceptives, while receiving real-time support from other clinicians when needed.¹²

Since the platform's launch in 2008 up until 2019, the CHWs who have used LivingGoods have delivered services to more than seven million people.¹³ A randomised controlled trial showed that it reduced under-5 mortality by 27%, infant mortality by 33% and neonatal mortality by 27%,¹⁴ which indicates that using a telemedicine approach for COPC can potentially improve population health outcomes.

In the South African context, Phulukisa equips HCWs with devices to measure and digitally collect multiple health data points that facilitate teleconsultations with doctors or nurses where assistance is required. HCWs can take healthcare services into the community by screening patients in their own homes. The Counselling Hub has managed to expand its service to more non-urban areas since introducing telephonic and video-enabled psychological therapy and counselling. Since patients don't need to travel to the facility to receive treatment, the stigma of mental healthcare has also been reduced. These are examples of how telemedicine provides patients with appropriate, cost-effective and convenient treatment. Improving the ease of access to healthcare services also improves patient outcomes by encouraging health-seeking behaviour among those who'd normally delay it (particularly for healthcare services with associated stigmas, such as mental health services or sexual and reproductive care), and by improving adherence to treatment.

With the added complexity of the Covid-19 pandemic, using telemedicine to enhance COPC is a key tool in delivering quality services and keeping track of high-risk patients in the health system, while also reducing the risk of infection to both the population and HCWs. Box 1 below describes how telemedicine has been used in the public sector during the pandemic to target high-risk patients and reduce mortality.

“Integrating the COPC approach with innovative telemedicine solutions could achieve a greater reach and increase the value of care provided to the population”

Box 1: Virtual Emergency Centre Tactical Operation (VECTOR) - how telemedicine can be used to target high-risk patients

Adapted from a case study written by Dr. Neal David, Operational Manager of the VECTOR programme.

Against the background of the Covid-19 pandemic, contingency plans and actions taken by the Western Cape Government Health (WCGH) were influenced by data that emerged daily. A team at the Provincial Health Data Centre (PHDC) had looked at mortality rates in the Western Cape and identified that diabetic patients were at a particularly high risk of dying from Covid-19. 52% of deaths were occurring in diabetic patients. The elderly and those with chronic kidney disease (a common diabetes-related complication) were at especially high risk.¹⁵ Additional data that emerged showed improved prognoses in Covid-19-positive diabetics with optimal glycaemic control,¹⁶ meaning that poor outcomes could be reduced with early, pro-active intervention. Equipped with this information, the WCGH developed a plan to connect high-risk diabetic patients who are Covid-19 positive with a medical management plan that would address their needs at an early stage of the infection – before their health deteriorated severely.

Key management stakeholders and experts in the management of diabetes designed an intervention for high-risk patients with diabetes. It was generally accepted that it was only feasible for the intervention to be executed by a dedicated team of medical officers (MOs) who would consult with patients remotely. In this way, a clear case for the use of telemedicine was identified.

A Standard Operating Procedure document with specific approaches to high-, medium- and low-risk diabetic patients was developed,¹⁷ which describes a telemedicine consultation for each diabetic category – as well as a suggested script and course of action to pursue. The aim of telephone calls to high-risk diabetic patients were to facilitate voluntary admissions to intermediate-care facilities if a patient was assessed as stable, or emergency admissions to a hospital if they were unstable. The MOs would be responsible for the referral process on the Vula app, or by consultation with the accepting facility.

The PHDC would provide this list of high-, medium- and low-risk diabetic patients, and any new patients added to it by means of the Single Patient Viewer (SPV) tool every morning, and the workload would be divided amongst the MOs. These patients would then be called, and the MOs would keep a record of all their calls using MS Forms. The output and outcomes of these calls, along with a combination of MO feedback and SPV-tracking, were monitored by the VECTOR team.

Importantly, the virtual medical care role that the VECTOR MOs were providing needed to be integrated with the physical role of all other roleplayers in the healthcare value chain. This necessitated onboarding the virtual team at the CTICC and the Brackengate Intermediate Care Facility (a purpose-built field hospital) via meet-and-greet sessions with the management and staff. It also led to upskilling both the virtual and ground teams around diabetic control and education, which has ultimately been beneficial in overall patient care – not only during COVID-management, but also post-discharge.

Table 3 presents the quantitative outcomes of the VECTOR intervention. It shows differences between the mortality rates for diabetic patients of high-, medium-, and low-risk groupings for both rural and metro areas. For a pre-intervention baseline, we looked at high-risk patients who hadn't received the intervention. In that analysis, there was a 28.3% mortality rate in Metro Health Services (MHS). In the post-intervention period, the mortality rate was 22.9%, which represents a 19% overall reduction for this high-risk cohort. Further analysis shows that of the patients successfully contacted by the team (given the large proportion of uncontactable patients), the mortality rate was 10.2%. However, selection bias for contactability may have had an influence on the outcomes.

Table 3: Comparison of pre- and post-VECTOR mortality rates across risk groups and districts in the Western Cape

	PRE-INTERVENTION MORTALITY	POST-INTERVENTION MORTALITY	VECTOR TEAM MORTALITY
Metro High-Risk	28.3%	22.9%	10.2%
Metro Medium-Risk	8.8%	8.0%	0%
Metro Low-Risk	8.1%	3.8%	1.1%
Rural High-Risk	28.7%	21.4%	8%
Rural Medium-Risk	9.1%	2.4%	3.4%
Rural Low-Risk	13.3%	3.4%	4.7%

It's worth highlighting that for the high-risk group, the analysis in the Metro and rural districts were remarkably similar, suggesting consistency in the risk carried by these patients irrespective of their location – and a comparable response to the intervention. Also note that the higher VECTOR team mortality for rural medium- and low-risk groups are from a single death in those groups and a smaller denominator in both of those calculations.

In summary, the VECTOR programme presented in Box 1 represents a data-driven, fit-for-purpose telemedicine initiative that has been operationalised with no formal telemedicine infrastructure other than the existing tools available to most individuals – which are smartphones, WhatsApp groups, email and Microsoft Forms. The patient lists that are available through the SPV tool are a function of the high-quality data collection and distribution capacity of the PHDC. The integration of the VECTOR MOs with other components of the health system has allowed the team to add value to the care of high-risk diabetic patients with Covid-19, and to significantly improve their outcomes.

Improving access to healthcare through optimising human resources for health

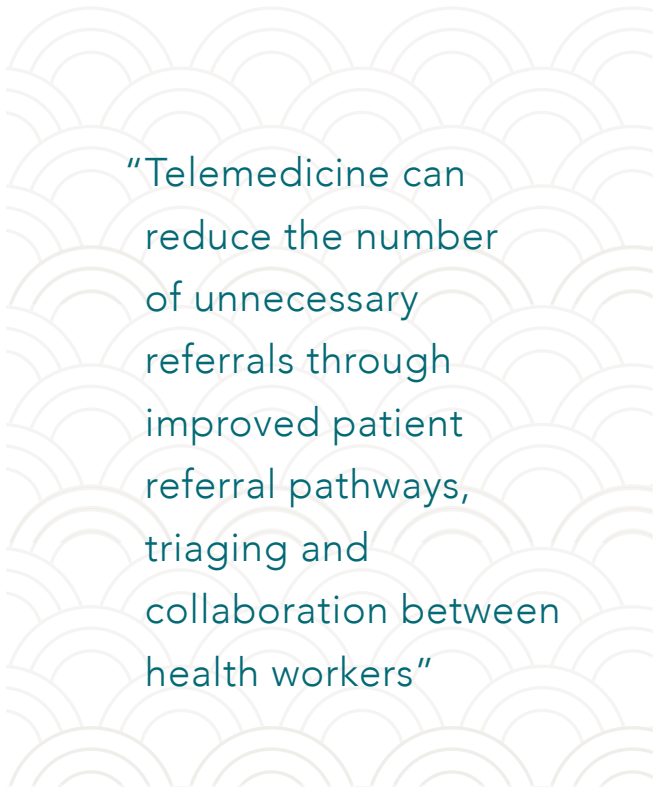
Given that telemedicine entails the delivery of healthcare over distance, HCWs using this technology are able to provide care to patients regardless of their location. This is particularly valuable for specialist care, where human resources for health are the most constrained, and for providing healthcare services to people in remote areas. In this way, telemedicine can increase the reach of healthcare services.

Telemedicine also enables task shifting¹⁸, which essentially means that it allows for more complex

tasks to be performed by relatively lower-skilled HCWs – with the support of more skilled HCWs. This is important in South Africa, where human resources for health – and particularly specialist care – are limited. Telemedicine provides an opportunity to expand access to healthcare through task shifting to nurses or community health workers with the support of more senior clinicians. In addition to increasing access to healthcare, technology-enabled task shifting has the potential to reduce the cost of delivering care in remote areas, and enables the transfer of skills to less-skilled HCWs. Through task shifting and the ability to extend services to remote rural areas, telemedicine has been shown to increase access to quality healthcare at a lower cost.^{19, 20}

In South Africa, rural or remote locations often struggle to retain skilled clinicians. It's in these settings that nurse-led telemedicine models, such as Healthforce, are most useful. Nurses can physically examine patients while video consulting with a doctor who can also see the patient. The nurses can use auxiliary medical devices such as electronic stethoscopes and dermatological cameras to examine patients, and these sounds or images can be transmitted to a doctor in real-time to assist with diagnoses. Telemedicine can even be used to facilitate locums at facilities that are short-staffed, or where a doctor is absent.

In a retrospective study of the Telehealth Network of Minas Gerais (TNMG) in the southeast of Brazil – a public telehealth service supporting primary care practitioners in 73% of municipalities in the state of Minas Gerais – it was found that municipalities with the smallest populations used teleconsultations the most.²¹ In these locations, nurses were most likely to provide teleconsultations, potentially due to a shortage of physicians in these smaller locales.²¹ The study also found that for dermatological cases specifically, there were often multiple telehealth queries related to the same patient, which showed that teleconsultations were being used to provide real case discussions, thereby preventing referrals in about 80% of cases.²¹ This is a clear example of how telemedicine can reduce the number of



“Telemedicine can reduce the number of unnecessary referrals through improved patient referral pathways, triaging and collaboration between health workers”

unnecessary referrals through improved patient referral pathways, triaging and collaboration between health workers. In combination, these efficiencies may reduce costs to the healthcare system.

Telemedicine also presents an opportunity for clinicians to provide care in more flexible ways. Several direct-to-patient (D2P) and P2P telemedicine providers interviewed for this study reported that many of the doctors they contracted were mothers with young children who preferred to work part-time, or retired doctors who still wanted to practice, but at reduced hours. These categories of clinicians were attracted to telemedicine because of the flexibility in the number of work hours and how these may be structured. Offering clinicians this degree of work flexibility enables more HCWs to be brought back into the labour force.

Like South Africa, Brazil is an upper-middle-income country with a vast geography. Box 2 below describes how telemedicine is used in Brazil to increase access to healthcare, especially given its human resource constraints.

Box 2: How telemedicine is used to achieve universal health coverage in Brazil

Brazil has a free public health system that aims to serve its entire population of 212 million people. This health system, Sistema Único de Saúde (SUS),² was established in 1990, but access remained a key challenge – especially to specialised practitioners.²² Telemedicine was identified as a critical element to realise the SUS principles of universality and to minimise the inequities that were present in the distribution of health resources across regions. The potential to conduct remote consultations with specialists, continued education for health professionals, and support for specialised care also increased the push to establish telemedicine.²³

When telemedicine was first introduced in Brazil in the 1990s, the implementation was fragmented and decentralised.²³ Yet by May 2000, a policy was developed for the use of telemedicine at national level. In time, the isolated parts of telemedicine delivery were integrated into two central parts of the telemedicine structure in Brazil: RUTE³, which is the Telemedicine University Network, and RTN⁴ – the Telehealth Brazil Networks Program.²³

RUTE's main objective was to deploy communication infrastructure at public universities, university hospitals, health institutions and certified teaching and research hospitals. Through its operations in several institutions and special interest groups, it provided a platform for different practitioners to share medical records, exams, consultations and specialist second opinions.²³

By 2007, the RTN had nine health centres located in public universities that were connected to 900 basic health units in 728 municipalities – all of which mainly provide support to remote and isolated areas. The health centres assisted in the delivery of healthcare at the primary level through teleconsulting, tediagnosis and tele-education.²³ RTN has since expanded and although it maintains a focus on primary healthcare service delivery, it now also includes more complex services.²⁴

In 2020, the RUTE platform was used to address the increasing need for specialist teams to manage cases of acute respiratory failure during the Covid-19 pandemic. Many of the cases required ICU beds and mechanical ventilation, which were in low supply. This led to the establishment of a protective mechanical ventilation protocol that was driven and capacitated using telemedicine. Telemedicine teams were established to provide remote support through a network of Respiratory ICUs.²⁵ During this pandemic, telemedicine has also been instrumental in facilitating distance learning and training so that more frontline professionals, doctors, nurses and physiotherapists were capacitated to provide care.

Some challenges impede the optimal use of telemedicine in Brazil. There's a lack of consensus about the benefits of telemedicine for the health system and the current ethical and legal apparatus. The necessary standards and regulations for its successful application are insufficient.²⁶ There are also some cultural aspects that challenge the traditional view of the medical practice, and consequently, the doctor-patient relationship. Reports have shown some patient hesitancy to substitute 'normal' face-to-face virtual contact with the technology supported intervention.²² A concerted effort to overcome the institutional and cultural barriers is essential to ensure that the full benefits of telemedicine are realised.

² This translates to Unified Health System

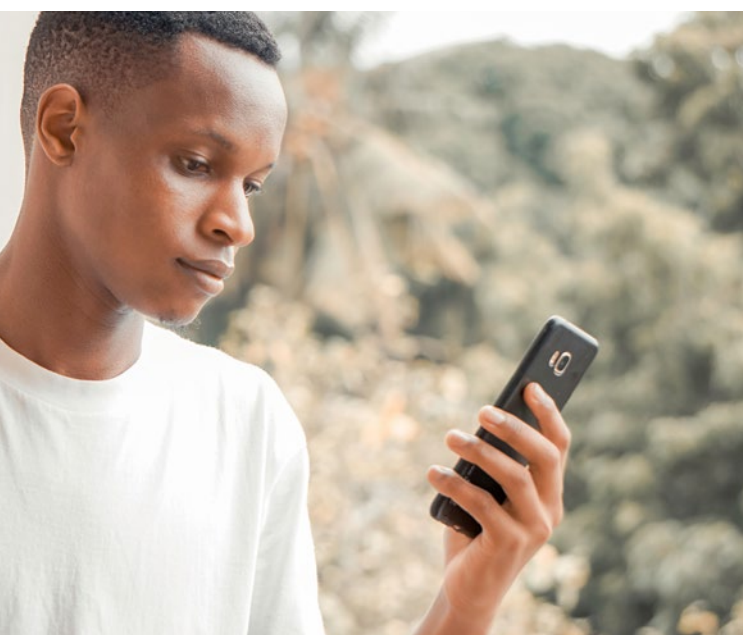
³ RUTE – Rede Universitária de Telemedicina

⁴ RTN – Programa Telessaúde Brasil Redes

Supporting UHC, quality improvement and health information systems infrastructure

The establishment of NHI²⁷ will be a catalytic factor in transforming the way health services are structured and delivered in the South African health system. With the move to UHC, there's not only a focus on providing affordable healthcare to most of the population, but also an emphasis on improving access to quality care while ensuring optimal population health outcomes. To effectively provide UHC and ensure sustainability, there needs to be a shift from the current operational model, which is based on a fee-for-service model, to a value-based (health)care model.²⁸ Value-based care focuses on outcomes that matter to the patient and optimises the costs to achieve them.

Providing value-based care proposes that the health system proactively seeks to deliver patient-centred care while focusing on quality rather than quantity.²⁹ The value-based care model emphasises documenting this process in an electronic health record system (EHR) so that it will be easier to capture patient and caregiver reported metrics. The EHR uses the metrics to check whether the care provided is aligned to what matters most to the patient – it adds value while at the same time measuring the financial burden of the care provision on the health system, as well as on the family. Therefore, moving to a value-based approach will



“Telemedicine lends itself to achieving some objectives of value-based care, because it provides a platform for patient-centred care while reducing costs to both the health system and users.”

also help low- and middle-income countries (LMICs) such as South Africa to achieve the best possible outcomes considering the financial constraints on the health system.

The eHealth Strategy highlights one of the key challenges South Africa faces in providing value-based care, namely that the existing health information system doesn't meet the requirements to support the health system's processes.¹³ This not only affects the monitoring and evaluation of performance, but also renders the health system unable to provide adequate information for the management of human and medical resources.

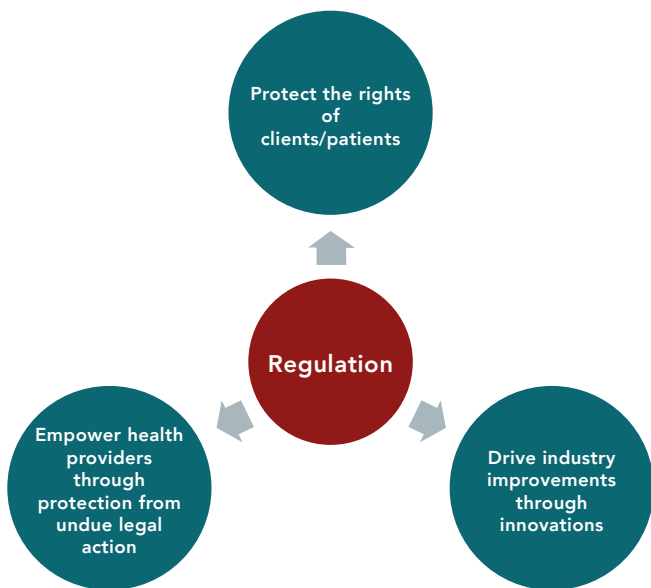
Telemedicine lends itself to achieving some objectives of value-based care, because it provides a platform for patient-centred care while reducing costs to both the health system and users.^{30,31} It makes healthcare more accessible to people whose geography and/or financial inability previously excluded or hindered them from accessing health facilities.^{30,31} Many of the providers listed in Table 1 and 2 have completely digitised patient data-collection and storage systems and create EHRs that are interoperable with other telemedicine platforms, and which can be integrated into legacy systems (such as Stone Three, Signapps, Healthforce, Allegra, Healthbridge and CLICKDOC, among others).

SECTION
2

Regulating for innovation in South African telemedicine

One major difficulty in regulating for innovation in the health sector is the need to balance the professional and ethical obligation to protect the rights of clients or patients; the need to protect or indemnify doctors from potential unnecessary legal action; and the need to create room for innovation in an industry where the stakes (people’s health and lives) are high.³² This combination of factors (outlined in Figure 1) doesn’t lend itself to risk-taking, but this doesn’t mean that there isn’t any scope for innovation should the appropriate regulatory strategies be employed.

Figure 1: The arms of regulation



2.1 What are the existing regulatory problems?

In *The Nurse Will See You Now* reports, we provide a detailed discussion of the existing guidelines of the HPCSA, how they’ve been temporarily relaxed due to the Covid-19 pandemic, and

“A major difficulty in regulating for innovation in the health sector is the need to balance the professional and ethical obligation to protect the rights of patients, and protecting doctors from potential legal action, while creating room for innovation.”

the shortcomings of the existing telemedicine guidelines. Telemedicine providers experienced the previous regulation as stifling to innovation and progress in healthcare. Before Covid-19, the HPCSA’s guidelines didn’t allow first-time consultations between patients and healthcare professionals through teleconsultation (i.e., D2P telemedicine) unless a healthcare professional was present to consult on behalf of the patient (i.e., P2P telemedicine). In addition, telemedicine providers found the guidelines impractical and onerous in some ways (such as requiring written consent from patients), and vague in others (for example, when is a relationship between a patient and a healthcare professional considered “established”?). One provider interviewed stated that the regulation led to “defensive innovation”, meaning that innovators were not designing for optimal outcomes for clients or health systems, but instead confined innovations to what was permissible by regulation. With a more



dynamic regulatory environment, providers may innovate more freely, which in turn may lead to better services.

Regulators generally take a reactive rather than a proactive approach

Based on interviews with South African telemedicine innovators, sentiments about existing telemedicine regulation were predominantly pessimistic. They perceived regulatory bodies as being slow, unresponsive, and taking a reactive rather than a proactive regulatory approach. Providers whose technologies used medical devices also expressed discontent with the slowness of the relevant regulator's approval process. However, one provider mentioned that the Covid-19 pandemic has helped to expedite the approval of devices.

The amended regulations were largely well received by industry players, but some issues still remain. During our interviews, it transpired that some providers want to see more explicit support of telehealth in regulation, while others are content with the Covid-19-induced changes remaining as they are. Several providers believe that the regulation is still too vague, leaving HCWs uncertain about the parameters they may safely operate within.

The current regulation is also said to lack protection for HCWs working within its bounds. This has led to some hesitancy to use telemedicine.

Most providers appreciate the need for regulation. There are limitations to telemedicine and as such, its use should have restrictions that protect patients by ensuring that HCWs don't operate beyond the appropriate scope, and have the necessary support when using telemedicine. The regulation needs to better balance protection with service improvement and market development.

The need for enabling regulation

Telemedicine merges health and information communication technology (ICT), which creates some regulatory and policy quagmires as issues that affect both health and ICT will impact telemedicine.³³ The issues, which don't traditionally fall within the ambit of health policy and regulation, but impact telemedicine, include the capacity of ICT infrastructure, data storage and protection, and authentication.

Policymakers need to consider electronic communications laws as well as data privacy laws when drafting guidelines. This will ensure that regulations provide an up-to-date and convenient reference for HCWs on how different aspects of telemedicine are regulated. Important aspects include e-scripting, reimbursement rates and the schedule of drugs that can be prescribed through teleconsultations, among others.

No clear guidance on appropriate reimbursement rates

Reimbursement models are a major factor in HCWs' uptake of telemedicine solutions. Telemedicine consultations are broadly reimbursed at lower rates than face-to-face consults. If this rate is too low, HCWs or telemedicine providers may choose to not provide these services and the uptake will remain low. According to the telemedicine providers interviewed, some medical schemes will only reimburse doctors at the telephonic consultation rate, which is 55% of the face-to-face rate.

Several providers are unhappy with this arrangement, since telephonic consultations are typically short and light, whereas telemedicine often aims to provide a more comprehensive consultation that can take as long as, or longer than, the face-to-face alternative. Some providers believe that all virtual consultations should be fully reimbursed since they often take the same amount of time from the HCW, or sometimes longer. However, others believe there's less value in providing virtual consultations than in person, and that it warrants a lower reimbursement.

At the time of writing, there were no established standards for the reimbursement of teleconsultations. Video consultations can be reimbursed at the same rate as telephone consultations. Most schemes and HCWs were aware of the reimbursement code for telephonic consultations but not for video consultations.

There are also inconsistencies in the way different telemedicine providers are reimbursed. One funder stated that they had created new reimbursement codes which refund doctors at 60- 75% of their standard consultation fees. However, teleconsultations with psychologists and psychiatrists are reimbursed at their full rates – although these have faced resistance from funders.³⁴

There are signs that some challenges are being addressed and that progress is being made towards more appropriate remuneration. Nevertheless, a glaring challenge remains – the lack of funder support for the nursing schedule of payments. It's a hurdle that nurse-based models must overcome and an important step in moving towards the use of less expensive resources in the healthcare environment.

Reimbursement discussions were focused on the private sector and thereby centre around what medical schemes decide. The public sector's current fixed-salary remuneration method would not face the same challenges; however, this may also change when the public sector starts contracting in resources from the private sector, as envisaged under NHI.

Some providers suggested that medical schemes should play a role in providing guidelines and limitations for the type of telemedicine solutions clinicians should use. This could be enforced through reimbursement structures. However, medical schemes shouldn't use their power to unfairly promote their own telemedicine solutions, as this would introduce anti-competitive dynamics in the market related to medical aid schemes running/contracting with their own telemedicine providers.

Ultimately, an independent study capturing the time spent with clients (including administration) on telemedicine consults vs. in-person consultations should be conducted.



2.2 The consequences of not improving existing telemedicine regulation

Losing the potential gains in cost savings to the health system and improved health outcomes

Telemedicine creates an opportunity to deliver healthcare more efficiently – in a way that’s more convenient for both patients and clinicians. Applications such as Phulukisa and Allegra’s Virtual Care offer solutions to resolve patients’ health concerns without having to visit health facilities, and to triage patients more efficiently. Quro’s wearable devices allow acutely ill patients to be monitored in the comfort of their homes, as opposed to costly extended hospital stays. These solutions have the potential to translate into huge savings for the health system. Access to care that’s more convenient to patients also improves health outcomes by improving retention in care and reaching patients who wouldn’t normally access certain health services.⁹

In an economically austere environment where the state fiscus has been constrained by years of low economic growth, as well as the recent addition of Covid-19-related economic challenges, it’s important to leverage technologies that can lower the cost of delivering quality healthcare. Telemedicine also has the potential to increase access to quality healthcare, and it therefore supports the move to UHC.

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Missing out on the opportunity to learn from the Covid-19 experience

The Covid-19 pandemic has created immense opportunities for learning in not only the South African healthcare market, but globally as well. It’s an opportunity to gather evidence on how telemedicine can support the health system and ultimately contribute towards better population health outcomes. Currently, it seems as if there are two potential outcomes for the South African telemedicine market. Firstly, if the existing relaxations in the regulation are removed and the HPCSA’s telemedicine guidelines revert to tighter restrictions, many of the learnings and innovations implemented since March 2020 will be lost. Alternatively, if the regulation remains as is, there’s an opportunity to incorporate recent innovations into the way care is delivered. It also presents the regulator with an opportunity to collect evidence on the benefits and drawback of telemedicine approaches and use it to refine policies.

Forfeiting a more pragmatic approach to patient confidentiality

Pragmatic privacy of information principles and protocols need to be established for telemedicine. Many HCWs are unaware of the telemedicine regulation. One study showed that less than 20% of HCWs using instant messaging to communicate with each other were aware that their communication was regulated and only 3% were compliant with the regulation.³⁵ There is also

anecdotal evidence of HCWs using messaging and video-calling applications, such as Skype, Zoom and Whatsapp, because they're free and ubiquitous, but these applications may not always have the required level of security to conduct consultations about sensitive and confidential medical information.

Since telemedicine is regulated by guidelines and not promulgated legislation, some telemedicine providers we interviewed were not even sure whether the regulation was enacted by law, and whether compliance was optional or not. This lack of clarity poses a potential risk to patients in terms of data privacy – and to HCWs who put themselves at risk of being sanctioned for violating the regulation.

2.3 Regulatory sandboxes to regulate innovation - lessons from the financial sector

Regulatory sandboxes have their origins in the financial sector. After the Great Recession of 2008, regulators encouraged rapid innovation in the financial services market, while managing the need for increased regulatory oversight following the financial crisis.³⁶ A regulatory sandbox is described by Jenik and Lauer (2017) as a framework established by a regulator that enables, "... small-scale live testing of innovations by private firms in a controlled environment [operating under a special exemption, allowance, or other limited, time-bound exception] under a regulator's supervision."³⁶ The term was coined by the United Kingdom's Financial Conduct Authority, the financial services regulator in the UK, to develop a framework for regulation that supported innovation and competition in the financial services market. The ultimate aim was to improve the quality and variety of financial services available to UK consumers.³⁶

In essence, this approach to regulating for innovation creates a controlled environment in which service providers can test or pilot their innovations.³⁷ Regulators can limit the number of clients providers have access to and, where necessary, create regulatory exemptions to observe



"Regulatory sandboxes create a controlled environment in which service providers can test or pilot their innovations and regulators can observe how innovations work and identify potential risks they may pose to consumers or the market."

how innovations work and identify potential risks they may pose to consumers or the market. It's also an opportunity for service providers to tweak their products to address any concerns the regulator may have.

In the financial sector, particularly following the 2008 financial crisis, regulators often try to provide protection against the systemic risk that poorly regulated financial services and products pose to the financial system. In the health sector, regulators are often more concerned with the risk posed to individual patients or clients if their rights are violated, or their health is compromised by the health service provided. In the case of infectious diseases, the inadequate provision of healthcare may also have system- or population -level consequences. Even though the types of risks may differ, the regulator's mandate is the same – to protect users of the system and by extension, the population at large.

In many sectors, particularly in this technology-driven age, regulators are often playing catch-up with innovators. Given that regulators' mandate is mainly to mitigate risk rather than enabling innovation, their response is often to shut down or limit the innovations they don't fully understand. Regulatory sandboxes allow for a more collaborative approach to regulating for innovation. Box 3 describes how the regulatory sandbox approach has been used to support innovation in the Singaporean telemedicine market.

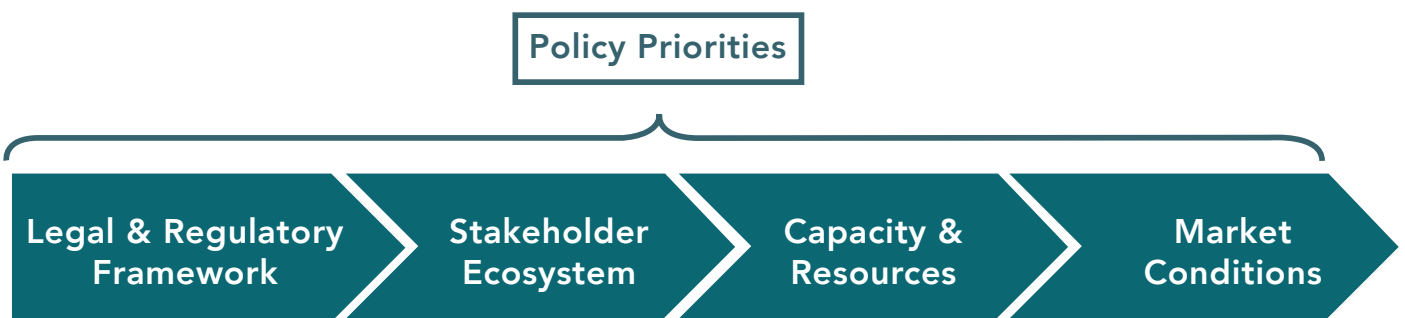
Box 3: Singapore’s regulatory sandbox approach to regulating for telemedicine innovation

Singapore is one of the few countries applying the concept of regulatory sandboxes to telemedicine. In April 2018, the Singapore Ministry of Health (MOH) launched the Licensing Experimentation and Adaptation Programme (LEAP).³⁸ LEAP was a regulatory sandbox initiative for telemedicine and mobile medicine that aimed to understand novel innovations in healthcare service delivery through partnerships with industry players at the early stages of service rollout. This created the opportunity for the MOH to “...review an effective, efficient and appropriate way to support innovation, while delivering care that prioritises patient safety and welfare.”³⁸

In light of Singapore’s growing incidence of chronic illness due to its ageing population, and recognising telemedicine’s ability to improve access to care, the MOH wanted to support the use of telemedicine for both simple acute care and the management of chronic illness.³⁹ Selected telemedicine providers were approached to participate in the MOH’s regulatory sandbox, offering providers a chance to develop innovative telemedicine models under “well-defined patient safety and welfare parameters.”³⁹ Added to this, providers were required to share key data on their services with the MOH to not just gather information on the innovations, but also on the development of the sector.³⁹ This allowed the MOH and telemedicine providers to co-create telemedicine regulation.³⁹ Once telemedicine providers received the required licencing, the sandbox would be over and they’d need to comply with the prevailing legislation.³⁹

There’s no one-size-fits-all approach to implementing regulatory sandboxes. Regulatory sandboxes have been applied in over 50 countries, mainly in financial services, with varying approaches. Before implementing the sandbox approach, Jenik and Lauer propose the following decision-making process.³⁶

Figure 2: Decision-making process for establishing a regulatory sandbox³⁶



Firstly, regulators need to consider whether the legal and regulatory framework supports the sandbox approach. It should be clear whether the regulator has the authority to issue waivers or temporary exemptions. Sandboxes are most useful in “...jurisdictions that have complex regulatory frameworks or highly prescriptive rules, each of which can present obstacles to innovation.”³⁶ In the case of South Africa, both of these conditions hold. The HPCSA can issue temporary waivers, as they’ve done recently with the change in legislation

that allows for first-time D2P telemedicine consultations. And as described in the Nurse Can See You Now report, the HPCSA’s telemedicine guidelines are highly prescriptive.

Secondly, the stakeholder ecosystem needs to be considered.³⁶ There’s often an overlap of different regulations and regulators that needs to be considered when implementing a regulatory sandbox.³⁶ For example, although the HPCSA has drafted the telemedicine guidelines, the nature

of telemedicine means that patient and provider information is shared and stored electronically. Therefore, the Protection of Personal Information (POPI) Act and the Electronic Communications and Transactions (ECT) Act should also be taken into consideration. There are likely other regulations that also impact telemedicine providers and this ecosystem needs to be considered when implementing a sandbox.

Thirdly, the regulator needs to consider their capacity in terms of staff, funding and time to implement regulatory sandboxes.³⁶ Where resources are low, processes that are lower cost, such as improving communication between innovators and regulators, should be considered.³⁶

Lastly, the conditions of the market need to be taken into account, such as the number of innovations in the market, the quality of these innovations, the level of competition in the market, the market's growth rate, and the level of development of the supporting infrastructure.³⁶

Due to the relaxation of the telemedicine guidelines and amendments to the national procurement regulations in response to Covid-19, a window of opportunity has been created for a sandbox-like natural experiment. It's given regulators an opportunity to observe how telemedicine innovations are developing in the current regulatory space. Box 1 provides an example of innovation occurring in the public sector through the VECTOR programme, and the Case Notes from the Frontier report shows how innovation has unfolded in the private sector.

In making the case for sandboxes in the telemedicine space, Bhatia et al (2020) argue that "Medicine is after all the original home of randomized controlled trials ... The profession has, for decades, strived to make the practice evidence-based. It is time to apply the same vigilance to digital health implementation, even during the pandemic. Regulatory sandboxes may present an effective mechanism to do so."³⁷



Recommendations

Regulation should support innovation

There are ways to design regulation to protect consumers and support market development. The HPCSA, NDoH, South African Health Products Regulatory Authority (SAHPRA), industry associations, telemedicine service providers, clinicians and other stakeholders need to learn from the experiences of other countries. There needs to be a full review of existing telemedicine regulation and enabling regulation such as POPI, the ECT and more to understand how telemedicine can operate in a way that complies with all relevant regulation.

SAHPRA should further streamline their review process for new products if those products already have approval from other international bodies, such as the US Food and Drug Administration or the EU's European Medicines Evaluation Agency.

The regulatory sandbox approach should be considered as a potential regulatory strategy that allows for the live testing of innovations at a smaller scale. This will allow the regulator to observe the potential benefits and risks of innovations before they're scaled up to the general public.

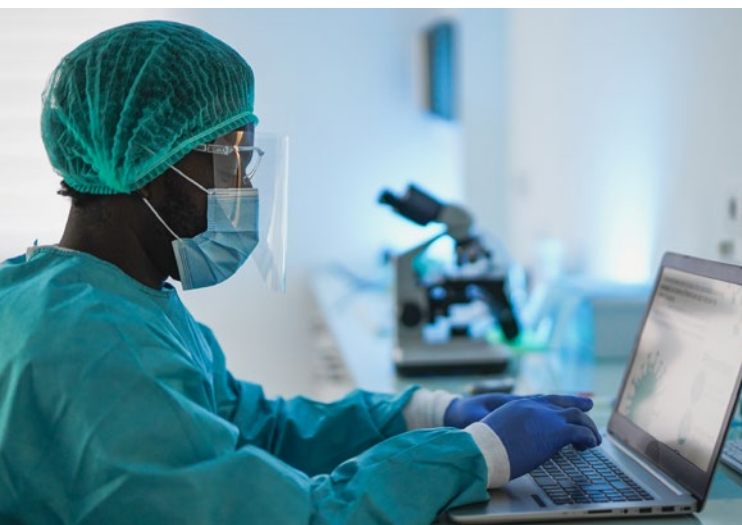
"There are ways to design regulation to protect consumers *and* support market development."

Deliberate and systematic collection of learnings to inform proactive regulation

As the ultimate regulator of the health sector, the NDoH should deliberately collect learnings on telemedicine. These learnings shouldn't only come from previous telemedicine projects that have failed, but also from cases where telemedicine was successfully harnessed during the Covid-19 pandemic. This is a not-to-be-missed opportunity to gather evidence.

Uptake for telemedicine by both HCWs and patients will require a change in behaviour. Although Covid-19 has created an impetus to use these services, their uptake will not happen entirely organically, it must be deliberately driven and supported. For HCWs there needs to be appropriate training, change management, and a technological support structure that can make learning and transitioning into a new way of delivering care less daunting.

An awareness has to be created among healthcare professionals of the risk of using certain messaging platforms for sharing patient information. Regulations also need to be clearly communicated



to health professionals to ensure that they know the risks posed to both patients and HCWs if they fail to protect the privacy of patient data.

Telemedicine guidelines should be updated

Providing clear guidelines on what can and cannot be treated virtually will empower HCWs to work confidently and mitigate the risk of them operating at their own discretion. This could, for example, restrict the use of virtual consultations to a defined list of conditions. It will protect HCWs acting within the confines of the regulation, and give them peace of mind against undue legal backlash if they're operating in a patient's best interests.

There should be security requirements for the platforms on which patient information may be discussed and shared. Awareness must be created around telemedicine guidelines so that HCWs know exactly how to use technology to protect their patients' privacy. Clear guidance is also needed about which messaging apps are safe to use, and which ones aren't.

Ensuring telemedicine training for healthcare professionals

Telemedicine must be embedded in healthcare professionals' training. It can't be stressed enough that it's not optional or a nice-to-have component of care – it's the way forward for ways to deliver



“A more collaborative regulatory approach is required between telemedicine providers, users, and regulators.”

healthcare services, and to varying degrees, it's already embedded in many health systems worldwide. Therefore, it's important for HCWs to receive training in providing care in this way.

Best practice guidelines should be developed on the HCW's training for teleconsultation services and virtual care.

Collaborative regulatory approach

A recognised industry association should be established to allow for a degree of self-regulation, but also greater collaboration in how guidelines are developed so that the needs of the telemedicine industry are represented. South Africa has a Digital Health Association (DHA) which aims to bring together a diverse group of industry participants who are passionate about the potential for telemedicine to significantly increase access to high quality and affordable healthcare for all South Africans.⁴¹ The DHA has compiled the Practice Guidelines for South African Telemedicine to advance telemedicine practices in South Africa in a responsible, professional, equitable and ethical manner.⁴¹ The DHA has used the South African telemedicine guidelines and incorporated best practices from US, EU and Singaporean telemedicine guidelines into their guidelines. However, the DHA is a new organisation and not yet a recognised regulatory or industry authority in the healthcare space.

Conclusions

The way in which the HPCSA frames the existing telemedicine guidelines makes it seem as if there's a trade-off between less restriction in the telemedicine sector and protecting healthcare workers and patients. However, this is a false dichotomy; regulations can be drafted in a way that supports innovation and protects the rights of healthcare workers and patients.

The current telemedicine guidelines still lack clear and unambiguous guidance on how and when telemedicine should be used. In fact, the temporary relaxation of these guidelines has created more uncertainty, as telemedicine users and service providers are unsure as to whether they'll remain in force or be revoked once the Covid-19 pandemic is under control. Patients aren't necessarily protected either, as the guidelines don't allow the telemedicine market to develop in a way that could increase access to quality healthcare that's more convenient and affordable.

Despite the perceived stasis caused by lockdowns and stay-at-home orders, there's been rapid and dynamic growth and innovation in the telemedicine sector. This growth spurt has the potential to create a more efficient, affordable and people-centric healthcare model. South African healthcare regulators need to capitalise on the existing window of opportunity for innovation, and observe what's currently happening in the telemedicine market. They also need to design guidelines and policies that are evidence-based and create a conducive environment for telemedicine innovation to thrive.



References

1. Gulube S. *Evaluation Report of the First Phase of the SA National Telemedicine System (NTS)*.; 2000. <http://www.kznhealth.gov.za/telemedreport.pdf>
2. Walters L, Mars M, Scott R. A Review and Critique of Teledermatology in the South African Public Health Sector. In: Maeder A, Ho K, Marcelo A, Warren J, eds. *The Promise of New Technologies in an Age of New Health Challenges*. IOS Press; 2016:143-151.
3. Side By Side. MomConnect and NurseConnect . Side By Side. Published 2020. Accessed June 21, 2021. <https://sidebyside.co.za/resources/momconnect-and-nurseconnect/>
4. Jithoo R, Govender P V, Corr P, Nathoo N. Telemedicine and neurosurgery: experience of a regional unit based in South Africa. *J Telemed Telecare*. 2003;9(2):63-66. doi:10.1258/135763303321327894
5. Chigona W, Cameron GT, Stam TL, Van Belle J-P, Wu S. *Linking Telehealth and Traditional Healers in South Africa*.
6. National Department of Health. *MHealth Strategy, 2015 - 2019, South Africa*.; 2019. [https://www.hst.org.za/publications/NonHST Publications/mHealth Strategy 2015.pdf](https://www.hst.org.za/publications/NonHST%20Publications/mHealth%20Strategy%202015.pdf)
7. National Department of Health. *National EHealth Strategy, South Africa 2012/13-2016/17*.; 2012.
8. NDoH. *Strategic Plan 2020/21 - 2024/25*.; 2020.
9. Percept Actuaries & Consultants. Non-facility based chronic medication delivery models: Economic Review. 2021;(March).
10. Mars M, Erasmus L. Telemedicine can lower health care costs in Africa. *Innovate*. 2012;7:32-33. Accessed June 11, 2021. <https://www.up.ac.za/media/shared/Legacy/sitefiles/file/44/1026/2163/8121/innovate7/telemedicinecanlowerhealthcarecostsinafrika.pdf>
11. Bam N, Marcus T, Hugo J, Kinkel H-F. Conceptualizing Community Oriented Primary Care (COPC)-the Tshwane, South Africa, health post model. *Afr J Prm Heal Care Fam Med*. 2013;5(1). doi:10.4102/phcfm.v5i1.423
12. Taylor CA, Lilford RJ, Wroe E, Griffiths F, Ngechu R. The predictive validity of the Living Goods selection tools for community health workers in Kenya: Cohort study 11 Medical and Health Sciences 1117 Public Health and Health Services. *BMC Health Serv Res*. 2018;18(1). doi:10.1186/s12913-018-3620-x
13. LivingGoods. mHealth | Living Goods. Published 2020. Accessed November 5, 2020. <https://livinggoods.org/what-we-do/mhealth/>
14. LivingGoods. Proof of Concept RCT. LivingGoods. Published 2019. Accessed June 11, 2021. <https://livinggoods.org/what-we-do/results-evidence-and-research/research-initiatives/>
15. Boule A, Davies M-A, Hussey H, et al. Risk Factors for Coronavirus Disease 2019 (COVID-19) Death in a Population Cohort Study from the Western Cape Province, South Africa. *Clin Infect Dis*. 2020;14:16. doi:10.1093/cid/ciaa1198
16. Zhu L, She ZG, Cheng X, et al. Association of Blood Glucose Control and Outcomes in Patients with COVID-19 and Pre-existing Type 2 Diabetes. *Cell Metab*. 2020;31(6):1068-1077.e3. doi:10.1016/j.cmet.2020.04.021
17. Western Cape Government Health. *Circular H159 of 2020: Standard Operating Procedure for Management of People with Diabetes and COVID-19*.; 2020. Accessed June 13, 2021. https://www.westerncape.gov.za/assets/h1592020_covid-19_sop_for_management_of_people_with_diabetes_covid19.pdf
18. Fulton BD, Scheffler RM, Sparkes SP, Auh EY, Vujcic M, Soucat A. Health workforce skill mix and task shifting in low income countries: A review of recent evidence. *Hum Resour Health*. 2011;9(1):1. doi:10.1186/1478-4491-9-1
19. De La Torre-Díez I, López-Coronado M, Vaca C, Aguado JS, De Castro C. Cost-utility and cost-effectiveness studies of telemedicine, electronic, and mobile health systems in the literature: A systematic review. *Telemed e-Health*. 2015;21(2):81-85. doi:10.1089/tmj.2014.0053
20. World Health Organization. *Global Diffusion of EHealth: Making Universal Health Coverage Achievable*.; 2016. http://who.int/goe/publications/global_diffusion/en/

21. Assis TG, Palhares DM, Alkmim MB, Marcolino MS. Teledermatology for primary care in remote areas in Brazil. *J Telemed Telecare*. 2013;19(8):494-495. doi:10.1177/1357633X13512059
22. de Varge Maldonado JMS, Marques AB, Cruz A. Telemedicina: Desafios à sua difusão no Brasil. *Cad Saude Publica*. 2016;32. doi:10.1590/0102-311X00155615
23. Silva AB, da Silva RM, Ribeiro G da R, et al. Three decades of telemedicine in Brazil: Mapping the regulatory framework from 1990 to 2018. Makkar A, ed. *PLoS One*. 2020;15(11):e0242869. doi:10.1371/journal.pone.0242869
24. Eisenstein E, Kopacek C, Cavalcante SS, Neves AC, Fraga GP, Messina LA. Telemedicine: a Bridge Over Knowledge Gaps in Healthcare. *Curr Pediatr Rep*. 2020;8(3):93-98. doi:10.1007/s40124-020-00221-w
25. Carvalho CRR, Scudeller PG, Rabello G, Gutierrez MA, Jatene FB. Use of telemedicine to combat the covid-19 pandemic in brazil. *Clinics*. 2020;75:1-2. doi:10.6061/clinics/2020/e2217
26. Caetano R, Silva AB, Guedes ACCM, et al. Challenges and opportunities for telehealth during the COVID-19 pandemic: Ideas on spaces and initiatives in the Brazilian context. *Cad Saude Publica*. 2020;36(5). doi:10.1590/0102-311X00088920
27. National Department of Health. *National Health Insurance Bill [B 11-2019]*.; 2019.
28. Cowley P, Chu A. Comparison of Private Sector Hospital Involvement for UHC in the Western Pacific Region. *Heal Syst Reform*. 2019;5(1):59-65. doi:10.1080/23288604.2018.1545511
29. Card AJ. Moving Beyond the WHO Definition of Health: A New Perspective for an Aging World and the Emerging Era of Value-Based Care. *World Med Heal Policy*. 2017;9(1):127-137. doi:10.1002/wmh3.221
30. Kantarevic J, Kralj B, Weinkauf D. Enhanced fee-for-service model and physician productivity: Evidence from Family Health Groups in Ontario. *J Health Econ*. 2011;30(1):99-111. doi:10.1016/j.jhealeco.2010.10.005
31. Hoffman DA. Increasing access to care: telehealth during COVID-19. *J Law Biosci*. Published online 2020:1-15. doi:10.1093/jlb/ljaa043
32. Botrugno C. Telemedicine in daily practice: Addressing legal challenges while waiting for an EU regulatory framework. *Heal Policy Technol*. 2018;7(2):131-136. doi:10.1016/j.hlpt.2018.04.003
33. Townsend BA, Scott RE, Mars M. The development of ethical guidelines for telemedicine in South Africa. *South African J Bioeth Law*. 2019;12(1):19. doi:10.7196/sajbl.2019.v12i1.662
34. Reddy S. Discovery reverse refusal to pay in full for telephonic and virtual psychotherapy. Published online 2020.
35. Borges Do Nascimento IJ, Oliveira JA de Q, Wolff IS, et al. Use of smartphone-based instant messaging services in medical practice: A cross-sectional study. *Sao Paulo Med J*. 2020;138(1):86-92. doi:10.1590/1516-3180.2020.0010.R1.28032020
36. Jenik I, Lauer K. *Regulatory Sandboxes and Financial Inclusion*.; 2017. Accessed March 31, 2021. www.cgap.org
37. Bhatia A, Matthan R, Khanna T, Balsari S. Regulatory sandboxes: A cure for mHealth pilotitis? *J Med Internet Res*. 2020;22(9). doi:10.2196/21276
38. Ministry of Health Singapore. Licensing Experimentation and Adaptation Programme (leap) - a MOH regulatory sandbox. Published April 18, 2018. Accessed April 1, 2021. [https://www.moh.gov.sg/home/our-healthcare-system/licensing-experimentation-and-adaptation-programme-\(leap\)---a-moh-regulatory-sandbox](https://www.moh.gov.sg/home/our-healthcare-system/licensing-experimentation-and-adaptation-programme-(leap)---a-moh-regulatory-sandbox)
39. Ministry of Health Singapore. Telemedicine and issuance of online medical certificates. Published April 4, 2018. Accessed April 1, 2021. <https://www.moh.gov.sg/docs/librariesprovider5/default-document-library/joint-smc-and-moh-circular-on-teleconsultation-and-mcs.pdf>
40. South African Government. Treasury on measures for Coronavirus COVID-19 emergency procurement | South African Government. Accessed April 8, 2021. <https://www.gov.za/speeches/treasury-measures-coronavirus-covid-19-emergency-procurement-28-apr-2020-0000#>
41. DHA. *Practice Guidelines for South African Telemedicine*.; 2020.



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