**Managing the COVID-19 pandemic using health informatics tool: international case studies in telehealth**

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Abstract

**Background**. -- The covid19 pandemic has brought about a paradigm shift in medical care and public health delivery systems. Through the adoption and use of telemedicine and telehealth practices, it will also impact health systems widely. However, the experiences of telehealth practitioners in the affected countries using telemedicine is largely untapped using systematic research. In this paper, we provide a first glimpse of the changing landscape by assimilating the “lived experience” of practitioners with “boots on the ground”.

**Methods.** -- We solicited responses from the IMIA members their practices and perception of telehealth practices during the times of COVID19 pandemic in organising and maintaining continuity of care. We then analysed their responses with respect to emerging themes, opportunities and challenges perceived, and mapped them to the WHO framework of strengthening health systems.

**Results.** -- We identified six emergent themes including government initiatives, emergence of innovations, mobile-based solutions, changes in perception and uptake of telemedicine, role of volunteers, and role of targeted education and training of providers and clients.

**Discussion**. – These themes indicate that the issue of telemedicine in COVID19 pandemic is multidimensional. Government laws and statues were identified in all situations; together these themes map well with the WHO’s framework of health systems strengthening. While COVID19 has thrown a “curveball” to telehealth practitioners, the collective response integrating technology and society has the potential to further strengthen health systems in the intermediate and long run.

Keywords: telemedicine, COVID19, practice, field experience, qualitative, health systems strengthening, framework

## Introduction

The COVID19 pandemic ushered in a paradigm shift in medical care and public health delivery. When the COVID-19 pandemic began to spread worldwide in early 2021, given its infectiousness and potential to rapidly transmit through healthcare providers, countries worldwide looked for ways to deliver healthcare services while maintaining the norms of social isolation and separation in the space of clinician-client encounters. As a result, the traditional face-to-face encounters either needed to be supplanted with technological solutions or alternatives were sought. Hence, adoption of virtual care such as through telehealth became commonplace worldwide. Even though telehealth and other virtual care tools existed pre-COVID, the need for public health practices such as physical distancing accelerated the pace of adoption of telehealth. Digital health innovations were rapidly implemented and scaled up to provide solutions for the management of COVID-19 as well as the management and follow-up of non-COVID diseases adversely affected. Digital solutions were used for disease surveillance, patient screening, triage of admissions, diagnosis, monitoring, contact tracing, patient follow-up, supply chain management, staff training as well as research reducing the burden for the overburdened healthcare staff. The challenges of COVID-19 pandemic and the resultant disruption of health services delivery due to lockdowns in many countries have generated interest in the practice of telemedicine across the globe and have changed practices and policies. Many countries have introduced new regulatory frameworks or revised existing frameworks to leverage telemedicine to overcome these challenges ().

Telemedicine is a powerful tool for health professionals and healthcare delivery systems to extend care but there are several challenges that reliance on technology alone could pose in the long-term sustainability and scale up of such approaches. For example, human-centred design approaches and local care delivery practices, barriers and enablers are at risk of not being considered (citation??). Besides, implementing new technologies in a pandemic adds to the existing complexities around change management, capacity building, and prioritization of care. A notable challenge in implementing digital health tools like health information technology (HIT) are unintended consequences post implementation. Various UICs including community, patient safety, information retrieval, individual-collaborative interchanges, and workflow issues have been described (Ash, Berg, & Coiera, 2004; Harrison, Koppel & Bar-Lev, 2007; Borycki et al., 2012; Gogia et al., 2016; Kuziemsky et al., 2016). [CK1] UICs remind us that HIT implementation is not without risk and expedited implementation of HIT such as telehealth in response to the COVID-19 pandemic could present an increased risk. However, at the same time we want to use COVID-19 as an opportunity to learn how we might increase our capacity for telehealth delivery while also accounting for UICs such as privacy and security, ethical and legal concerns, and social issues (Kaplan, 2020; Mosnaim et al., 2020). Regardless of whether HIT adoption occurs over years or weeks such as during COVID-19, it is still a complex adoption process and we must account for implementation factors such as workflow, organizational and social, and ethical and legal concerns.

High performing health systems may be more resilient in responding to COVID-19 (Legido-Quigley etal., 2020). Roughly, a high performing system is one in which all aspects of a health system have been accounted for in COVID-19 response strategy. While medical informatics and more specifically telehealth, is the focus of our working group, we recognize that HIT is only one component of a health system and it must be aligned with other system components including human resources, financial, and governance (Champion et al., 2019).

While COVID-19 has identified many opportunities for telehealth, it has also identified challenges that the medical informatics community must overcome as part of developing a sustainable telehealth system for critical response. Health systems refer to a system of systems that includes technology, data, organization, financial, human resource and policy components. A good reference is the World Health Organization’s definition and model of health systems (https://www.who.int/topics/health\_systems/en/). Systems thinking is an approach used to understand the interaction of system components to enable us to design policy and HIT to support health system objectives (Adam & de Savigny, 2012; Chang, Ogbuoji, Atun, & Verguet, 2017). Telehealth is a classic example of a health system in that it consists of several interrelated parts that must work in unison for telehealth to effectively contribute to healthcare delivery (Champion et al., 2019). A system thinking framework allows us to understand how telehealth must evolve or be adapted to enable critical response such as the COVID-19 pandemic.

In this paper, we describe the international experiences of implementing telemedicine/ telehealth in the context of the ongoing COVID-19 pandemic. These experiences comprehensively outline the practices from across the globe. The exemplars outlined by the members of the IMIA – telehealth working group from their direct involvement in the design, implementation and evaluation of these efforts, providing a global overview, while focusing on context, local health systems capacity, implementation considerations, gleaning from the deep technical expertise of the working group and sharing key lessons to inform policy across the world. The objective of this paper is to compare telehealth responses to COVID-19 across several countries so we can identify what has worked well but also what we can learn in order to better enable telehealth capacity for critical response such as during a global pandemic.

## Methods

The objective of this paper is to identify key learning points relevant to global experiences with telemedicine use during the COVID-19 pandemic. Therefore, all members of the Telehealth Working Group of the International Medical Informatics Association were invited to provide their inputs and reflections on telemedicine use in response to the COVID-19 pandemic.

The contents of individual contributions were analysed to identify emergent themes related to pros and cons of telemedicine use during COVID-19. We used an existing health systems strengthening framework [Sacks et al., 2019] and our prior work at comparing international telehealth implementation [Kuziemsky et al., 2018; Kuziemsky et al., 2020] to guide the analysis and to identify health system considerations for telemedicine use during critical response. We then mapped the emergent themes from the narratives on to the WHO health systems strengthening framework building blocks and examined how each emergent themes mapped on to the building blocks. The purpose of this exercise was to assess how telemedicine practice in a time of extraordinary situation such as COVID19 pandemic might provide future directions in cases of pandemics and which elements work best.

## Results

We obtained a total of 14 text responses and reflections from the members of the IMIA working groups in eight countries. We analysed data from practitioners in India, Sri Lanka, Brazil, Colombia, Canada, New Zealand, The United States, and The United Kingdom. Collectively, these represented the major hotspots of Covid19 and in case of New Zealand, provided a snapshot of the arrangements for a health system that effectively mitigated the impact of COVID19 and were able to eliminate the infection. The themes were derived from the text. The complete text of the narratives are presented in the Appendix.

We identified six themes emerged from the consultations, descriptions, and perceptions of telehealth services from practitioners with “boots on the ground” across the world. These were: (1) government initiatives, framing of laws and legal statutes to enable telehealth services; (2) emergence of network, vendors, and innovations; (3) preponderance of mobile device based solutions; (4) changes in the uptake and perception of telemedicine; (5) role of volunteers as enablers of the telemedicine; and (6) targeted training and education of providers and clients

We defined government initiatives, framing of laws and legal statutes as formal mechanisms put in place by governments in the country or all situations or descriptors where respective country governments would deliver services. For the emergence of network, vendors, and innovations, we considered descriptors where respondents described how different providers came together to provide services in novel ways using the telehealth technology; for mobile based solutions, we considered “Apps” and “texting based solutions”. We present short snippets of relevant text from the corpus below.

(1): **Government initiatives, law and statutes**. –

(India): “The Government of India issued an advisory for those with chronic conditions to avoid visits to healthcare facilities for non-emergency consultations, resulting in significant challenges to those with chronic conditions and multiple morbidities. These disruptions led to the accelerated release of the Telemedicine Practice Guidelines 2020 (TPG) which provides a legal framework for delivery of health care remotely through telemedicine services by the Medical Council of India which caters to practitioners of modern Medicine”

(India): “The release of telemedicine practice guidelines by the Government of India in March 2020 though originally intended for the practice of virtual consultations by registered medical practitioners belonging to the allopathy system of medicine also lead to the development of practice guidelines by councils for alternate system of medicine”

(India): “The Integrated Disease Surveillance Program (IDSP), which is a nation-wide surveillance system for epidemic prone diseases has been activated by the Ministry of health and family welfare towards COVID response, and is being further strengthened with substantive digital inputs”

(India):” setting up of the National Telemedicine Taskforce by the Health Ministry of India, in 2005, paved way for the success of various projects”

(Brazil): “Brazilian telemedicine law has been promulgated and it is valid as long as the pandemic takes”

(Brazil): “Legal authorization of telemedicine by a Federal Law [April 15th 2020] - Several practices have been permitted even remote consultations and prescriptions, complying to some requirements to provide security to the process and safety for the patients”

(Sri Lanka):” Health Information Unit of the Ministry of Health, Sri Lanka made a set of guidelines to assist these voluntary participating doctors using this new platform. Currently, The National eHealth Guidelines and Standards (NeGS) are being updated to include Telehealth services”

(New Zealand):”… rapid introduction of electronic prescribing … by the Ministry of Health, the Medical Council of New Zealand and the NZ Telehealth Leadership Group, … determined new rules for electronic prescribing using NZePS with a manual signature exempt temporary waiver from the NZ Government”

(Colombia): “When COVID stroke, Colombia issued an exception law, where all face to face and elective procedures were suspended … law facilitated telemedicine and telehealth services that required direct interaction with patients”

(UK): “In England the COVID-19 pandemic has resulted in policies and implementations to address the challenges in delivering care differently with a further shift to community care, maintaining access and introducing new ways of working to reduce the possibility of overwhelming the health service and reducing morbidity and mortality including protecting people most vulnerable to the virus”

(UK):” In England general practice has moved form 90% of face to face consultations to 85% remote consultations mainly using telephone, video consultation or texting. All NHS secondary care providers have access to video consultation technology”

(UK):” NHS England and NHS Improvement (NHSEI)provide a national direction on service improvement and transformation, governance and accountability, standards of best practice, and quality of data and information. NHSX (nhsx.nhs.uk) is responsible for driving digital transformation and leading policy implementation and change”

(Canada):” One benefit of COVID-19 was that the rapid shift to virtual care required adapting physician fee schedules, including new billing codes and updated practice guidelines. While each province and territory implemented their own billing code for virtual care, there were many similarities across Canada[CK4] . By the end of March 2020, all provinces and territories had some version of a billing code to support virtual care”

(Canada):” the BC Ministry of Health, in association with a group of health organizations including the Rural Coordination Centre of British Columbia, First Nations Health Authority, BC Emergency Medicine Network, Doctors of BC, Provincial Health Services Authority, and Providence Healthcare, set up a network of virtual care to support clinicians-to-clinicians and clinicians-to-patients telehealth services, collectively named as Real Time Virtual Support (RTVS) services”

(2): **Emergence of networks, , innovation, and vendors**. –

(India): “… network of health focused innovators came together on a common technology platform as Project StepOne”

(India): “In India, several health start-ups offered video consultations”

(India): “higher sales of Tele-stethoscopes and other remote clinical and observational devices has been reported”

(India): “… online meetings have replaced physical conferences almost completely”

(Sri Lanka):” during the COVID pandemic, the general public was unable to visit a health care facility even if it was next door. Alternative methods were needed urgently for screening patients as well as for the follow-up of chronic diseases who need long term care. This vacuum resulted in mushrooming of Telehealth service vendors”

(Colombia): “Analysing the National registry of providers we can see the explosion of new enabled registered services. There is a high concentration in "reference" services”

(Canada):” This deployment of not simply one line of telehealth but a network of services presents excellent opportunities for scale up and spread of services, and insights for future improvement”

**(3) Mobile device based solutions and apps**. –

(India): . – “Most teleconsultations are still largely through WhatsApp and Telephone with emails coming a distant 3rd.”

(Sri Lanka): “The "MyHealth Sri Lanka" application (<http://mdiit.gov.lk/index.php/en/digital-news/item/78-the-mobile-app-myhealth-sri-lanka>) was made to empower citizens with correct knowledge for correct decision making”

(New Zealand):” The Ministry of Health … introduced the NZ COVID Tracer App, a digital diary using QR codes scannable on mobile phones”

(United States):” AZCOVIDTXT is a powerful bilingual (English and Spanish) system to help the citizens of Arizona, especially the more vulnerable and underserved populations, successfully cope with this pandemic”

(UK):” A Digital First Primary Care approach supports patients to use online tools to access all primary care services, such as receiving advice, booking and cancelling appointments, having a consultation with a healthcare professional, receiving a referral and obtaining a prescription.”

(UK):” Text messaging is used to communicate with patients for a range of reasons including booking appointments, self-help web links, attaching documents/images and flu/covid-19 campaigns”

**(4) Change in the perception or uptake of telemedicine**. –

(India): “Its use for teleconsult was largely frowned upon but has been demand driven by patients as well as forced upon by the clinicains who are themselves vary of facing the patients directly. The concept of Telehealth has shifted from remote care to a “I would rather not see a patient physically”.”

(Brazil): “Healthcare professionals, not only physicians, have embraced remote care and a lot of fear of using technology has been surpassed … Self-care algorithms have been adopted as an acceptable resource of health care by patients, healthcare providers and policy makers”

(New Zealand): “Healthcare services thus had 48 hours to switch service delivery from in-person to telehealth, and this was over a weekend! GPs were asked to switch 70% of their consultations to telehealth … Secondary care providers (hospital based care) started to run telehealth consultations in their outpatient departments””

(UK):” In England general practice has moved form 90% of face to face consultations to 85% remote consultations mainly using telephone, video consultation or texting.”

**(5) Role of volunteers**. –

(India): A volunteer based network of health focused innovators came together on a common technology platform as Project StepOne

(India): The Telemedicine Society of India in partnership with the Digital Health India Association pooled a team of volunteer resource persons who designed an online “Train to Practice Telemedicine Certificate Course”

(Brazil): “NUTES-UFPE implemented a remote monitoring center for patients with flu-like symptoms [possible covid cases] and mental health issues related to pandemic context. This service was, on the first moment, composed by volunteers and after some weeks,”

(UK):” Volunteers have been engaged supporting over 2 million people at risk such as delivering food and medicines, driving patients to appointments and phone calls for the isolated. They are managed through a dedicated mobile app.”

**(6) Targeted training and education of providers and clients**. –

(India): “designed an online “Train to Practice Telemedicine Certificate Course” and began delivering it within ten days of the release of the telemedicine practice guidelines. This online course delivered as a webinar consisted of four modules of 20 - 30 minutes duration each was followed by questions and answers apart from pre-course and post-course quiz”

(India):” Training of healthcare professionals through online modules on iGOT (integrated Govt online Training platform ) has been emphasized .More than 25 lakh officers have registered themselves for an online training module for capacity-building to effectively fight against the coronavirus pandemic”

(India): “Ministry of Health & Family Welfare, Govt. of India is implementing an eHealth project including Telemedicine on National Medical College Network (NMCN) for interlinking the Medical Colleges across the country with the purpose of e-Education and National Rural Telemedicine Network for e-Healthcare delivery”

(New Zealand): “Health Informatics New Zealand and the NZ Telehealth Forum & Resource Centre ran webinars for health providers on telehealth consultations … NZ Telehealth Forum & Resource Centre provided information for both health providers and consumers on how to run telehealth consultations”

(UK):” Engaging healthcare professionals and the population regularly during the pandemic was essential in providing uniform trusted information. Communication directly with healthcare professionals is via a central web-based cascading alerting system for issuing health messages and other safety critical information and guidance. Communication with the population is through a government website”

Table 1. Opportunities and challenges for implementation as identified in the text corpus

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| **Opportunities** | **Challenges** |
| “accelerated release of the Telemedicine Practice Guidelines 2020 (TPG) which provides a legal framework” | “Despite the proliferation of these Apps which served more as appointment systems and with a payment gateway, they have hardly made a dent into actual remote care delivery, published figures regarding usage are sparse.” |
| “***There has been a sharp*** rise in the number of telemedicine apps.” | “for now, the ones who posses mobile phones and are more technically savvy are reaping higher benefits” |
|  | “Sadly there is a somewhat over proliferation with terms like infodemic being floated. This related to the high amount of user fatigue” |
| “Patients and professionals have been able to interact in a safer environment considering contaminating clinical status of the patient” |  |
| “Telemedicine business models have been evolving from a patient-healthcare provider model (person to person), to an institutional level, including, but not limited to, hospitals, pharmacies, clinical analysis laboratory” |  |
|  | Patients and healthcare professionals are not yet fully aware of privacy risks and data protection best practices when using digital environments |
|  | “Not enough training opportunities to healthcare providers about how to best provide remote care, including etiquette and semiology maneuvers” |
|  | “Main challenge is to make a proper system to regularize internet based prescriptions which is a main modality in the clinical part of Telehealth which is called Telemedicine” |
|  | “1) Integration and connectivity of technology in health and care organisations. 2) The integrated care record is being implemented and has to scale across the system further. 3) Significant funding and resources have been made available during the pandemic and if this reduces new innovations and scaling of current proven technologies will have less impact. 4) Educational resources and training in digital technologies for professionals and the population is essential to ensure tools are used effectively and promote empowerment and self-management. 5) People who are not digitally connected need an approach to gain the benefits of digital inclusion to enable high quality care.” |
|  | (Canada): “One such challenge is a lack of a national medical license as physicians are licensed in a specific province or territory. This challenges is significant if telehealth needs to be provided to a patient in a different province or territory where the physician is licensed. The ability of a physician to provide telehealth in a different province varies across the provinces and territories[CK2] []. For example, the provinces of Ontario, Nova Scotia, and Newfoundland and Labrador do not require an out of province physician to obtain provincial licensure to practice telemedicine. Other provinces (e.g. Alberta) do not require an out of province physician to obtain a licence but they are only able to provide emergency or temporary telehealth services |
|  | A final challenge is that the transition to virtual care is very much a work in progress. Some clinical tasks transition better to virtual care. Care management and monitoring for patients with chronic or complex conditions has transitioned better to virtual care than diagnostic tasks that may require physical exam procedures as part of the diagnosis. |
|  | telehealth services were not covered under provincial funding models. |
| One benefit of COVID-19 was that the rapid shift to virtual care required adapting physician fee schedules, including new billing codes and updated practice guidelines |  |
|  | Delivering equitable and high quality care with this distribution of population is challenging in normal times, and magnified even more during the COVID-19 pandemic |
| deployment of not simply one line of telehealth but a network of services presents excellent opportunities for scale up and spread of services, and insights for future improvement. This publicly funded network provides a comprehensive safety net for vulnerable patients and health providers needing real time, urgent support with clinicians and colleagues in aid |  |

Table 2. Mapping on to WHO health systems strengthening themes

Mapping on to WHO health systems strengthening building blocks frameworks

|  |  |
| --- | --- |
| **WHO HSF Components** | **Themes** |
| Service Delivery | Emergence of networks, innovation, vendors; mobile based apps |
| Health workforce | Role of volunteers and changes in the perception of telemedicine |
| Information | Use of mobile based apps and targeted training of providers and clients |
| Medical products, vaccines, and technologies | Mobile based apps |
| Financing | Government initiatives, Laws and statutes |
| Leadership and governance | Government initiatives, laws and statues, and role of volunteers in organising delivery of care |

## Discussion

As evidence continue to emerge in how countries have addressed the issue of covid19 pandemic, there is a need for evidence on the role of using telehealth and telemedicine in responding to the pandemic. This paper described the international experiences of telehealth usage in response to the COVID-19 pandemic and is a starting point for a global framework for telehealth usage in critical response.

Several common themes emerged from the various international perspectives presented in this paper.

COVID-19 has created a virtual world. It is important that we do not lose the connections that were built but it is equally important that the IMIA community provide guidance for telehealth usage to safely increase its usage. We also need to remember that we are not here to solve telehealth implementation to solve COVID-19. Rather, we are here to make recommendations on how we can better enable telehealth delivery to support critical response such as during a global pandemic.

The key outcome from this paper is that telehealth capacity must be in place prior to a pandemic.

We all know that there is a deficiency of available open source telemedicine solutions all over the world which are easily installable and interoperable. (Like the DHIS2 there to collect aggregated public health data).

As we are unable to develop a software solution by IMIA, I suggest at least we should develop a Minimum Data Set (MDS) that can be used as a standard for all over the world. We can concentrate on it especially in sharing COVID related data in international travel where telemedicine is important.

References (Pending)