3

# Automation vs. Innovation: Unexplored Strategies to Improve Virtual Care

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**Abstract.** While there is a global desire to increase digital health capacity, digital health should transform health services delivery rather than simply automate – or worse – replicate existing practices. Failing to capitalize on this transformative potential misses an opportunity to engage patients and other users to provide a more person-centered experience. However, digital transformation done recklessly can disrupt workflow, alienate users, and jeopardize patient safety, as we have observed with implementation of many digital health tools. This paper uses a telemedicine example to provide insight into how digital health innovation can be a meaningful enabler of health system transformation. Examining different ways to leverage digital health technologies is crucial to best capitalize on their potential.

**Keywords.** telehealth, telemedicine, digital health, health innovation, health services

## 1. Introduction

As traditional health systems evolve to become learning health systems, we should anticipate changes in core processes, including patient care delivery, clinical teamwork, and information seeking. Globally, the push for increased digital health capacity has driven these new care delivery models. The COVID-19 pandemic illustrated that digital health could play a more substantial role in health system transformation than it has to date [1]. Healthcare organizations and consumers pivoted to telehealth platforms during the pandemic [2]. While increased telehealth delivery improved access for some, it also accentuated the digital divide in many parts of the world [3]. Digital health is not a blanket solution to systemic health system issues like rising costs, clinician burnout, and health-related social needs. We need radical thinking, new collaborations, and disruptive innovation to design new offerings strategically [4].

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We posit that health systems face an innovation chasm in that we automate existing tasks rather than leveraging the innovative potential of digital health tools. Health Information Technology (HIT) features are often underexplored, limiting their innovation in support of care delivery outcomes [5]. There is hope, however. Studies have described unintended patient care and administrative benefits and outcomes that surpass what the technology was designed or intended to do [6].

To catalyze change, it is crucial to differentiate between automation and innovation. Automation is the digitization of a process, while innovation embraces creativity and vision to transform a process [7]. Health systems are complex adaptive systems characterized by rich connections, non-linear interactions, and emergent properties or actors [8]. To improve healthcare delivery, we must be purposeful in designing new tools and approaches that are the driver for a new health ecosystem. We recommend a formalized approach that examines how different users, settings, and contexts adopt and use digital health artifacts. A first step is to draw upon principles of person-centered design by studying the systems where the work is done, empathize with the users, and challenge our assumptions on digital health design. In this paper, we study telemedicine as a use-case to illustrate how to understand user needs more deeply and to re-imagine how innovative virtual health technologies and processes can transform health systems.

## 2. Telemedicine: Are We Automating or Innovating?

At a high level, telemedicine is defined as using technology to deliver health services at a distance [2]. While early literature on telemedicine focused on clinical services, recent studies have shown that telehealth can support a broader array of health system needs, including team collaboration, supply chain support, and medical education [2]. Many instances of telemedicine are faithful reproductions of traditional in-person visits (e.g., telephone encounters, videoconferencing). These narrow models typically automate face-to-face care and, in doing so, "bake in" many current health systems problems.

Telemedicine is helping healthcare organizations and advocacy groups reach a wider audience. However, telemedicine is not substantially changing how we engage patients, enable collaboration, access information, make decisions, and deliver care. We are not fully capitalizing on telehealth to support broader health system goals. To reach breakthrough innovations we need to define the problem, explore how people want to use digital health, borrow ideas from other industries, and teach a different healthcare delivery model.

## 3. From Telemedicine to Virtual Care

Drawing on the background literature and the authors' clinical experience, we identify four strategies to enhance "virtual care" showcasing telehealth's innovative potential. We discuss opportunities and challenges for how telehealth can evolve for each category. We also offer a strategy to turbocharge change without disenfranchising the underprivileged.

## 3.1. Enhanced Clinical Workflows

Clinicians and patients often only think of synchronous consults such as telephone and videoconferencing when considering ways to engage in virtual care. While these are important service offerings that increase specialty access in rural areas (e.g., dermatology) and help address acute encounters (e.g., suicidal thoughts, pediatric respiratory illness), they do not represent all current care delivery needs or models. Asynchronous telemedicine, such as secure messaging and e-consults, supports workflow that can be completed without any live interaction. This gives consumers more autonomy and flexibility in how they access and receive care. For example, patients can complete intake questionnaires when creating their telehealth account profiles. The clinician can check for safety alerts and best-practice guidance prior to the encounter to triage high-risk encounters or send messages before the visit. Asynchronous consults also create a sense of personalization – or anonymity, depending on a patient's need – that can bridge or "balance" the patient-practitioner relationship. Many emerging telehealth companies, such as GoodRx Care, Amazon Pharmacy, and eMed, focus on creating a workflow that improves throughput by enabling the provider to access information quickly and respond.

## 3.2. Consumer Centered Design

Consumer expectations can be positive and negative drivers of change. Consumers often have issues using telemedicine, citing equipment or technical problems, while providers can appear distracted online and report a perceived inability to conduct a virtual physical exam [2,9,10]. More concerning, patients may feel rushed or unable to ask questions during the visit. Many tools we develop for consumers to participate in their health fail to address users' needs, capabilities, and limitations (e.g., digital health literacy). This, in turn, can limit adoption or disenfranchise the underprivileged [11]. For example, laboratory results in patient portals are often PDFs that look like the reports clinicians receive. This can confuse or alienate patients [12]. Artificial intelligence (AI)-enabled tools, such as Chatbots, could enhance telehealth and impact individual health through personalized reminders and motivational messages for patients to refill medications, manage their diet, and increase exercise [13]. However, developers and researchers must first contend with the "black-box" problem when the decisions AI products make cannot be understood or explained even by their developers. The black-box problem can produce unanticipated or dangerous results in high-stakes settings like healthcare [14]. Attention to AI safety and transparency is necessary to combat this issue. It is also necessary to engage a diverse range of stakeholders and adopt a consumer-centered approach to the design of enhanced telehealth tools to ensure we provide care responsibly [15].

## 3.3. Health Equity and the Digital Divide

Social and structural determinants of health are well known to impact healthcare access and patient outcomes disproportionately. However, innovation in virtual care is not simply about translating existing in-person healthcare methods to digital platforms. Rather, it requires us to question the very meaning of healthcare and to examine the roles of both healthcare providers and patients. Unfortunately, health system reform often fails to involve patients in its design process. This exclusion especially impacts marginalized and vulnerable populations with complex and chronic conditions, financial difficulties, and language and cultural barriers [16].

With person-centered care in mind, we urge the adoption of Design Thinking, which emphasizes empathy toward users to identify unmet and pressing needs. Patients are not a collection of health conditions; they are people with families, friends, and all different socioeconomic statuses, lifestyles, and beliefs. How and why patients need and want to access virtual healthcare must be identified and should be the basis of virtual care. The aim of virtual care should be to deliver effortless, flexible, and responsive services for patients of diverse socioeconomic and cultural backgrounds and technology literacy levels. Virtual care platforms should also be context-sensitive, designed for "hybrid" settings that integrate or transition seamlessly to in-person care or low-tech solutions. Finally, virtual care should provide a non-linear navigation system, offering multiple ways to access information and care.

## 3.4. Training and Education for Health Professionals

Health professionals providing virtual care on the front lines of the COVID-19 pandemic had little formal telehealth training. They learned how to use it for tasks such as assessment and diagnosis out of necessity [2]. Health professional schools, programs, and accreditation organizations quickly recognized the need to define new educational competencies and curricula for telemedicine. Parenthetically, we have yet to grapple with measuring competence or quality. We, therefore, saw an opportunity to conduct a more formalized needs assessment of learners and develop training that blends clinical and digital health skill sets. We have developed a telemedicine training curriculum that includes topics on "webside" manner, patient safety, and the digital divide. To align telehealth skills with an evolving health ecosystem, we created educational content covering virtual teams, peripheral devices, telemonitoring, mobile apps, and hybrid workflows [17]. We also showed students how to combine store-and-forward images, teleconsultation, and secure messaging into a seamless teledermatology workflow. We should continue to expand training opportunities to include all provider types and to continue to develop training that aligns with modern health system needs such as team-based care delivery.

## 4. Discussion and Conclusions

The nature of a complex adaptive system like telemedicine, and other evolving digital health paradigms, means we cannot always predict how a system will work; outputs do not always equal inputs. And yet, there is tremendous global pressure from healthcare executives, consumers, and commercial vendors to act quickly and learn through serendipitous discovery. While we acknowledge – and share – this sense of urgency, Hemant Taneja said it best when he wrote, "'Minimum viable products' must be replaced with 'minimum virtuous products'…" [18]. Failure to account for inherent complexity can lead to unintended consequences. Our premise is "innovation must replace automation" for health system transformation. Not taking advantage of the interactive and evolving nature of a complex adaptive system like health systems is an opportunity lost to ideate, design, and innovate in pursuit of health system transformation. Telehealth can be an enabler of goals like system equity if we purposefully design systems to achieve such goals [19].

This paper describes how moving from telemedicine to virtual care can enable a path to transform health system delivery. We identified four strategies to improve "virtual

care" and provided examples of the opportunities and challenges when using them to promote and implement meaningful change. Digital health innovation requires informaticians – and their colleagues from other disciplines – to rethink systems design and health human resource training. Stated plainly, if we train health professionals to use a system the way we always have, there will be few incentives to innovate. However, digital health is only a tool; people and technology are both systems. As we use HIT to enhance the telehealth experience, we must listen to our users, challenge our assumptions, and ensure we do not hurt the vulnerable or widen the digital divide.

## References

[1]   Peek N, Sujan M, Scott P. Digital health and care in pandemic times: impact of COVID-19. BMJ Health Care Inform. 2020;27(1):e100166.
[2]   Basu A, Kuziemsky C, de Araújo Novaes M, et al. Telehealth and the COVID-19 pandemic: international perspectives and a health systems framework for telehealth implementation to support critical response. Yearb Med Inform. 2021 Aug;30(1):126-33.
[3]   Cantor JH, McBain RK, Pera MF, Bravata DM, Whaley CM. Who is (and is not) receiving telemedicine care during the COVID-19 pandemic? Am J Prev Med. 2021 Sep;61(3):434-8.
[4]   Lesselroth B. Clinicians must reinvent the medical record to stimulate the adoption of electronic medical records. Medscape J Med. 2008;10(2):45.
[5]   Sherer SA, Meyerhoefer CD, Sheinberg M, Levick D. Integrating commercial ambulatory electronic health records with hospital systems: an evolutionary process. Int J Med Inform. 2015;84(9):683-93.
[6]   Kuziemsky CE, Borycki E, Nøhr C, Cummings E. The nature of unintended benefits in health information systems. Stud Health Technol Inform. 2012;180:896-900.
[7]   Johnson PC, Laurell M. Ots C. Sandström M. Digital innovation and the effects of artificial intelligence on firms' research and development–automation or augmentation, exploration or exploitation? Technol Forecast Soc Chang. 2022;179:121636.
[8]   Sturmberg JP, O'Halloran DM, Martin CM. Understanding health system reform – a complex adaptive systems perspective. J Eval Clin Pract. 2012;18(1):202-8.
[9]   Gordon HS, Solanki P, Bokhour BG, Gopal RK. "I'm not feeling like I'm part of the conversation" patients' perspectives on communicating in clinical video telehealth visits. J Gen Inter Med. 2020 Jun;35:1751-8.
[10]  Greenhalgh T, Wherton J, Papoutsi C, Lynch J, Hughes G' A'Court C, Hinder S, Fahy N, Procter R, Shaw S. Beyond adoption: a new framework for theorizing and evaluating nonadoption, abandonment, and challenges to the scale-up, spread, and sustainability of health and care technologies. J Med Internet Res. 2017;19(11):e367.
[11]  Monkman H, Kushniruk AW. The consumer health information system adoption model. Stud Health Technol Inform. 2015;218:26-31.
[12]  Monkman H, MacDonald L, Nøhr C, Tanaka JW, Lesselroth BJ. Hidden in plain sight: overlooked results and other errors in evaluating online laboratory results. Stud Health Technol Inform. 2022 Jun;290:867-71.
[13]  Lau AYS, Staccini P, Section Editors for the IMIA Yearbook Section on Education and Consumer Health Informatics. Artificial intelligence in health: new opportunities, challenges, and practical implications. Yearb Med Inform. 2019 Aug;28(1):174-8.
[14]  Kuziemsky C, Maeder AJ, John O, Gogia SB, Basu A, Meher S, Ito M. Role of artificial intelligence within the telehealth domain. Yearb Med Inform. 2019 Aug;28(1):35-40.
[15]  Kushniruk A, Monkman H, Borycki E, Kannry J. User-centered design and evaluation of clinical information systems: a usability engineering perspective. Cogn Inform Biomed: Hum Comput Interact Healthc. 2015:141-61.
[16]  Kayser L, Nøhr C, Bertelsen P, Botin L, Villumsen S, Showell C, Turner P. Theory and practice in digital behaviour change: a matrix framework for the co-production of digital services that engage, empower and emancipate marginalised people living with complex and chronic conditions. Inform. 2018;5(4):41.
[17]  Lesselroth B, Monkman H, Palmer R, et al. Teaching teledermatology: a simulation pilot for health professional students. Stud Health Technol Inform. 2022;294:953-4.
[18]  Taneja H. The era of "move fast and break things" is over. Harv Bus Rev. 2019 Jan;22:22.
[19]  Kuziemsky C, Hunter I, Udayasankaran JG, et al. Telehealth as a means of enabling health equity. Yearb Med Inform. 2022;31(1):60-6.