Expediting a Changing Attitude: Technology in Medicine

Sunjit Singh Parmar[1]; Simran Parmar[1]

[1] University of British Columbia Faculty of Medicine

As recent as a decade ago, physicians did not routinely implement basic technological (tech) tools that are considered indispensable today.[1] Devices such as portable ultrasounds are a case in point: considered by some to be a recent feat and an essential office tool, they have been available since the mid 1970's.[2] Efforts that have increased the uptake of technology in medicine focus on addressing challenges that healthcare providers face in its implementation.[1] It is incumbent on the doctors of today to stay current with new technologies in order to be aware of the out-of-clinic information platforms being used by their patients. This is an opportunity for the healthcare provider to serve as both a guide and a collaborator.

We are in the age of technology and, as advances are being made in every field, it follows that we would see an increased use in the realm of medicine. Nonetheless, it seems there are as many counter arguments as there are documented benefits to furthering the use of technology in medicine.[3,4] One frequently-referenced barrier to the adoption and recommendation of technology-driven interventions from the perspective of some physicians is endangering the physician-patient relationship.[4] Through holistic electronic access, the physician may become privy to medical information previously unmentioned by patients. Physicians may also face patient dissent following unauthorized information disclosures secondary to ethical obligations.[4] This can create a precarious situation of newfound transparency between practitioner and patient.

The emerging domain of e-health encompasses technologically savvy concepts applied to tackling every day health challenges.[5] Current and coming examples include facilitating video-chats between physicians and their remotely situated patients and equipping healthcare users with mobile devices for receiving appointment alerts, respectively.[6,7]

Presently, the healthcare system regularly employs only the aforementioned e-health tools and such portable devices as mobile ultrasounds.[2,7,8] An up-and-coming phase of tech in medicine revolves around online applications (apps) as well as attachable gadgets, such as smartphone glucometers, for the purpose of monitoring and maintaining health by giving charge to the patient.[9,10]

Though the technological advances outlined in this paper are by no means exhaustive, they allude to a plethora of functional possibilities. Indeed, each one of these technologies is amenable to a multitude of permutations and hence patients and physicians alike gain enormous functionality from a single smartphone.[10]

Notably, however, patients have access to potentially false or misleading information online, whether or not physicians condone it. By being a part of changing times, however, physicians can help guide patients to appropriate sources and, through such regulation, are better positioned to assess patient-collected data and provide informed care.[9,11]

The present opportunity to bring to fruition an era of research in health technology is an exciting time for both physicians and patients. Some of the more prominent benefits of deploying such tools as smartphone glucose monitors include patient empowerment, increased accessibility, better primary prevention, and decreased cost in providing health care.[7,9] In the case of the aforementioned aid specifically, patients are able to track and view their glycemic indices over time and enter meals to record the subsequent impact on blood-glucose. In this way, patients become both learners and stewards in their own health.[5,9,10]

A major aspect of technology in medicine is facilitation of data tracking from the comfort of patients' homes, ushering in a generation of truly patient-centred care. In the process, individuals are empowered to be frontrunners in monitoring their health.[9] This in turn reduces reliance on health care authorities, potentially bolstering patients' sense of self as partners in their health while reducing the time burden on physicians.[4,9] The grandfathered trend of physicians as decision makers is in fact being phased out due to growing awareness of patient autonomy and its contribution to beneficence of care.[4] In effect, through supporting use of technology in medicine, we may simply be accelerating a happening shift from physician paternalism to patient empowerment.[2,4,9]

Technologically-driven interventions are also generally immune to the dilemma of accessibility being limited by patient ability, time, or location.[7,9] For example, people with disabilities may be confined to their homes, but with newer technology, they may be able to communicate to a health care provider without the burden of commuting. Telehealth may be a means of improving the availability of health care services for people limited by residences in remote communities as well.[7] We must, of course, factor into consideration the cost of setting up tele-health sites, financial compensation for the involved medical personnel, and a tech maintenance budget. Technology may also enhance efficiency further for the growing number of patients whose schedules are more amenable to typing in data on their smartphones than to planning health care visits.

Corresponding Author:
Sunjit Singh Parmar
sunjitparmar@alumni.ubc.ca

Primary prevention would be boosted since apps on phones and computers could fill the void between health care visits, improving monitoring of health data and potentially significant adverse events.[9,10] Those with chronic health issues can receive reminders for information such as appointments and treatment adherence.[6,8] Early diagnosis is not only more cost-effective but also a patient's right. Withholding or even neglecting to offer such potentially life-saving amenities as health data tracking applications compromises the standard of care for patients. In the world of controlled trials, it is in fact considered unethical to continue experimentation once a given treatment arm has benefited from the intervention being tested.[12] This furthers the case for why technology-driven advancements aimed at disease prevention should transcend provider biases. The number of studies supporting the greater efficacy of technology are only increasing.[4,13]

Technology allows healthcare providers to save time from making large differential diagnoses. They may focus on aggregates of symptoms that patients record on smartphone apps regarding exercise habits, for instance. Such holistic, objective data can also decrease the financial strain associated with initiating costly and ineffective health treatments and investigations.[14]

Mobile health exemplifies the application of a simple, affordable technology in combatting a once challenging medical dilemma: treatment adherence.[8] This has particular utility through its application in marginalized populations like individuals with HIV.[15] Poor medication adherence, accessibility, and improper clinical follow-up invariably result in increased morbidity and mortality. Tech interventions such as e-health provide a patient-friendly text message interface that helps manage treatment regimens, minimizing avoidable health adversities.[15,16]

Nonetheless, user and provider hesitancy in uptake and promotion of technology in medicine is not uncommon. Reasons for this apparent reluctance will be discussed next and include safety, cost, practicality, and accessibility. In general, electronic health data across North America has seen a steady rise in annual hacking breaches, reaching over 20 per annum in the recent years – constituting up to 1 in 3 patient records being transiently exposed.[17] Health applications catering to a select number of users may be able to curb such breaches through appropriately budgeting for out-sourced app security IT. Industry standard does not suffice when it comes to storing people's health information.[4,17]

Implementing online systems to access electronic data can also pose the risk of internally compromised privacy and confidentiality.[3,4] Although legislation exists to protect those seeking insurance, many unaware citizens may fear that data sharing could generate such consequences as restricted coverage by insurance companies.[4]

The cost of initiating and managing an electronic system in a care home or hospital may be unnecessary as well since the vast majority of smartphone apps are often gratis or associated with a nominal fee.[10] Nevertheless, it is inappropriate to assume that all patients are able to afford a smartphone or computer.[3] Without the device itself, the issue of promoting a system of online health management is irrelevant.

Leaving aside the issue of cost and security, there is the question of practicality. For instance, how may the health care provider assure themselves of the accuracy and reliability of the data? Is it practical for the health care provider to synthesize and aggregate data from the various sources the patient has used in managing their health? Of utmost concern and perhaps what most conflicts with current physicians is the threat that this movement poses to their role as health leaders. Physician services may seem to be rendered dispensable with the implementation of apps that track health data and potentially diagnose.[4]

We have briefly touched upon the positive value of online data in increasing accessibility for those limited by ability, location or time. We must, however, consider the level of literacy required to use these systems. Implementation and uptake of such technology platforms necessitates and presumes a proportionally literate population: it would be imperative to consider user ability amongst all potential users of tech platforms – be they geriatric, indigenous, or immigrants.[5,18,19]

It is upon the doctors of tomorrow to be aware of newer devices and, if relevant, advocate for the application of such readily available technologies. From a medical student perspective, it is almost daunting to see the volume of generational patients who reference smartphone apps or online health aids to senior physicians. Without familiarity or personal usage, it is challenging to provide advice regardless of the credibility of such e-health tools. Despite this apparent ubiquity of electronics, though, not every person in this technological age is "tech savvy."[5] Consequently, this may raise the question of equitability.

Hence, it is imperative to the success of a technological initiative to ensure that it suits the demands and preferences of both the users and providers. To this effect, it may be useful to generalize such guidelines as the HIV Engagement Interventions Criteria, which were designed to summarize the ideal characteristics of a technological approach to enhancing HIV care.[20,21] According to these criteria, it is pivotal to the success of an e-health initiative to maintain a patient centered approach while still being cognizant of the feasibility of the given intervention.[20,21] For instance, an idealistic focus on patient preference over feasibility could pose an insurmountable challenge come time to implement the technology. It would instead be more constructive to gauge the overall value that said intervention holds to the population in question, its acceptability based on the beliefs of the community, and the accessibility for all eligible individuals.[20,21] Feasibility more specifically entails an examination of the affordability by the responsible governmental body as well as the intervention's scalability. These tenets must be met for a truly measurable impact on community health.[20,21]

The era of prescribed smartphone apps and data tracking is fast approaching, and although not every technological intervention is equally effective, they all have the potential to supplement existing health care practices. As the next generation of physicians and patients alike make conscious efforts to gain comfort with the surging tech age, they will be in a better position to appraise the growing utility of new and developing devices. Clinical technology is indeed a rapidly growing sector of health care and one that is likely to see fortification in the near future.[4]

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