Preamble to the Future of Digital Health in Emergency Medicine: *The Lost Tourist*

Michael Schull

There are no quick solutions to fixing Canada’s emergency care systems. The reality is that, pre-pandemic, our EDs were already overcrowded, our patients waited too long and staff suffered from work stress. Our efforts should not be directed toward turning the clock back to pre-pandemic conditions; rather, we should be focused on developing and implementing a model for what we want the future of emergency care to look like in Canada.

The challenge of getting to that state from where we are is reminiscent of the lost tourist driving through rural Ireland who, when he comes across a farmer in a field, stops and asks him how to get to Dublin. The farmer thinks for a moment and replies, “Going to Dublin are ya? I wouldn’t start from here.” Like the lost traveller, our starting place may not be the one we would choose, but it is where we are.

There are a few key attributes of better emergency care system that we can work toward. One is meaningful horizontal integration with the rest of the healthcare system, especially primary care, and community-based services. Too often in the ED we fly blind, with limited access to information about a patient’s medical history, care providers and prior investigations. Lacking the information to choose wisely, we choose safely, often ordering tests that would not otherwise be necessary. Similarly, our ability to connect patients for needed care or follow-up post ED discharge is often limited to ‘hope-and-a-prayer’ faxes transmitted to clinics that may or may not agree to see the patient at some uncertain time in the future.

Ensuring primary care and hospital records are available as part of a shared provincial electronic health record (EHR) is critical. Better information sharing could also enable more cost-effective virtual emergency care. In some provinces today, the EHR, if it exists at all, consists only of a viewer with a somewhat random and incomplete collection of records in non-standard formats and timeliness. Furthermore, accountability to populate EHR systems is lacking: why not make payment for any publicly funded healthcare service conditional on the real-time uploading of the clinical record to the EHR in a standard format?

A more integrated digital emergency care system will allow an actual appointment, with a date and time, to be booked before the patient leaves the ED. Better yet, why not have the patient book it themselves, at a time of their choosing? Such certainty gives both ED provider and patient peace of mind and can enable the physician to be more circumspect in ED investigations, knowing the patient will have timely follow-up.

Giving patients access to their own data (which, increasingly, patients are considered to own), will empower them, give them more control and ability to manage their healthcare, and help improve outcomes. Patient access to their health data need not only be one-way; patients could also enter their own health data such as biophysical measurements from wearables.
patient reported symptoms, and patient reported outcome measures, which are critical to understanding important outcomes of ED care.

Finally, we must consider whether some we may think of as ‘lost ED tourists’ are not really lost at all. While some patients would almost certainly seek care elsewhere if alternatives were available and accessible, for many others the decision to seek care in the ED is a simple pragmatic one given that they believe they need ED care. The ED provides a one-stop shop for medical assessment, labs tests, imaging, treatment and consultation with specialists if needed. Indeed many patients know through personal experience that they will likely be sent to the ER anyway if they first seek care elsewhere. Efforts to fight this trend by limiting ED access to so-called inappropriate patients in order to focus on ‘real’ emergencies may be destined to fail.

Societal expectations may be partly at play; many patients today are used to getting what they need when they need it in the manner most convenient to them (think Amazon, Uber eats or on-line banking), and the ED as one-stop-shop may be the health system manifestation of that phenomenon. Rather than devising strategies to reverse these trends, like generals planning to fight the last war, perhaps we need to embrace that today’s patients are voting with their feet, and plan accordingly.

This requires re-imagining EDs and building the necessary integration with primary and community care, supports for frail elders, better mental health, addiction and social services, enhanced access to 24/7 diagnostic testing and ensuring a full suite of follow-up clinic and services are available to be booked in the ED. While this may sound Pollyanna-ish, the truth is, innovative examples are increasingly found in our system, but remain a patchwork. These range from EDs designed with specific supports for geriatric care, pathways for rapid low-barrier access to addiction services, and homeless shelter services integrated with EMS. These must be scaled up and properly funded, with adequately trained staff (often not doctors and nurses, but other key members of the healthcare team).

All of us, patients and providers, are the lost travellers. Together, we must envision and then build an innovative and integrated future state for emergency care, using all the tools at our disposal, if we are ever to find our way.

References

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The Future of Digital Health in Emergency Medicine

Submission to EM:POWER from members of CAEP Digital Emergency Medicine Committee

Kendall Ho, Betül Akbuğa Özel, Elyse Berger Pelletier, Kiran Grant, Nour Khatib, Eddy Lang, Jackie Tsang.

Introduction

Digital Health (DH) encompasses a rapidly advancing collection of technology-enabled tools to improve access to health care services and information. As described by the Health Information and Management Systems Society (HIMSS), “Digital health connects and empowers people and populations to manage health and wellness, augmented by accessible and supportive provider teams working within ... digitally-enabled care environments that strategically leverage digital tools, technologies and services to transform care delivery.” (a)

The World Health Organization (WHO) identifies three key objectives in adopting and scaling up DH to “accelerate global attainment of health and wellbeing” (b): “1. Translating the latest data, research, and evidence into action... 2) Enhancing knowledge through scientific communities of practice... and 3) Systematically assessing and linking country needs with supply of innovations....” Emergency medicine can capably contribute to all three objectives through health services research and implementation in urgent and emergency care domains.

While the potential for DH to transform healthcare has been recognized for several decades, the pandemic precipitated the rapid and massive clinical adoption of DH through Virtual Care (VC) services and remote patient monitoring (c). These practices facilitated the delivery of health services, while maintaining social isolation in compliance with public health policies to avoid viral transmission. The rapidity of DH adoption led to both opportunities (d) and challenges(e) for emergency medicine.
On one hand, appropriate use of DH and VC can potentially reduce emergency department (ED) surges, overcrowding and long wait times, provide support and knowledge exchange with colleagues practicing in rural communities, and support safe discharge and patient self-management through remote monitoring. On the other hand, poor design and implementation of DH and VC can result in paradoxical overcrowding of EDs through poor VC case management by health professionals who unnecessarily send patients to the ED for care. Additionally, VC’s attractive practice and compensation models can draw emergency physicians away from the ED, where they are most needed.

It is not only essential to purposefully integrate these approaches with traditional emergency medicine service delivery to optimize patient safety and convenience, but also to provide value to the healthcare system. Working towards a future of hybrid care (f) that fulfills the quintuple aim will preclude the need to choose either VC or in-person care, but rather encourage the thoughtful combination of both to optimize emergency health service delivery and transform our specialty. (g)

This chapter aims to map out the current landscape of DH and VC in emergency medicine, identify opportunities and areas of concern, and propose a roadmap where DH and VC can be effectively embraced as integral parts of our discipline.

How can digital health creatively support EM?

VC is the best known and most widely used type of DH in emergency medicine. COVID-19 provided the impetus for many hospital-led VC programs across the country, aimed at preserving the healthcare system’s scarce in-person resources while increasing access to care. For example, some EDs in Ontario started offering a “virtual ED” to provide care to patients with urgent, but non-life-threatening concerns. (h) Prior to the pandemic, other emergency VC services included telemedicine to support prehospital care. In BC and Alberta, patients who contacted 811 and were triaged by a nurse to attend an ED, were instead assessed virtually by an emergency physician. The preliminary results were promising, with virtual ED physicians safely and cost-effectively diverting a significant number of patients away from the ED. (i,j)

Currently, EDs face overcrowding and long wait times. (y,z) VC can mitigate this, as evidenced by from British Columbia’s HEiDi project, which provided VC that resulted in high patient satisfaction and ED avoidance in lower acuity cases. (i). DH is especially beneficial for healthcare providers if VC is accessed with provincial health records. In this way, there can be seamless communication with primary care with more transparent and efficient prescribing of diagnostics and therapies.

In addition to the positive impact that DH could have on the Canadian ED system, its implementation could also serve as a global model for digital ED health. Canada is well poised to be a leader in DH due to the socialized healthcare and the widespread adoption of electronic health records. (aa) Furthermore, publicly posted wait times and ED performance metrics have been implemented in Canada, which illustrates the power of digital innovations in this country’s EDs. (bb)

Home monitoring and wearables are technologies that can benefit patients in need of emergency care. They can be divided into out-of-hospital and in-hospital wearables. In the community, devices paired with smartphone applications can detect rhythm changes in individuals with atrial fibrillation, measure adherence to oral medications, and track changes in spirometry in individuals with lung disease (k,l) and
other chronic conditions who are decompensating. (n). Monitoring medications after discharge from an ED visit can help patients recovering from acute injury, such as tracking opioid use (o). Other wearables are specifically designed to act as an overall health safety net, capable of tracking and automatically alerting family and/or healthcare providers about changes in vital signs, and potential falls. (p) In hospital, wearables can monitor patient vital signs, or remote telemetry, for patients who are not in a physical space with monitors (m). In Canada, this could be particularly beneficial given the worsening ED crowding problem. Tragic instances of patients dying in Canadian ED waiting rooms and hallways beg the question of whether wearables could increase the monitoring capacity of local EDs at relatively low cost.

In the future, machine learning (ML) and artificial intelligence (AI) will have important roles in the ED. For physicians, AI has demonstrated promise in assisting diagnostic imaging interpretation, predicting mortality in sepsis and assessing risk in syncopal patients for a future cardiac event. While the “black box” of AI functionality, privacy and medical liability need to be addressed, there is no doubt that AI can lessen cognitive load and stress by adding a level of predictive modelling medical decision making. (s,t,u) Recent leaps in large language processing, such as ChatGPT, suggest that AI also has the potential to aid in providing detailed medical records based on short instructions, without providers having to create a template.

At a systems level, AI is being used to determine staffing ratios based on patient flow models. Given ED workforce challenges, using AI to better allocate manpower could be promising. Of course, staff would not be amenable to ever-changing schedules even if it had the potential to better meet patient demand. As such, the potential for AI to enhance the efficiency of healthcare delivery must be balanced with the limitations and wellbeing of the workforce.

**Challenges to Incorporating DH and VC into Emergency Medicine**

VC in medicine is well over a century old (v), and remote communities in Canada have used VC to help treat emergency patients well before the COVID-19 pandemic. Nevertheless, ongoing challenges to its use must be addressed, including:

- data security concerns and privacy,
- limited physical exam options
- health equity concerns, for example the risk of alienating vulnerable groups due to technology and access issues. The homeless, older persons and new immigrant populations are prime examples
- the perception among many emergency physicians that virtual visits have increased ED visits. A recent study bit Kiran et al demonstrated that physicians with a high proportion of VC did not have higher ED visits for their patients than those who provided the lowest levels of virtual care. (w). Further study, addressing the full spectrum of ED-UC VC is needed.
- workforce issues, including those in which the limited resource of emergency physicians is drawn to less onerous, but less essential work in certain VC settings
- the loss of in-person care, which could adversely affect the culture of emergency medicine and benefits accrued by face-to-face care contact between doctor and patient

The Canadian Medical Protective Association (CMPA) has set out the following additional challenges that must be considered when providing VC (x):
• risk of exacerbating the fragmented approach to health care across Canada
• inconsistency in standards and guidelines regarding when it is reasonable to use virtual care;
• lack of proper infrastructure and training on the various modalities of virtual care; and
• lack of access to secure virtual care platforms.

A major concern is the private involvement in DH development. While innovation is welcome and fueled by entrepreneurship, careful guardrails are needed to ensure that private interest does not influence the processes or privacy of care. (cc,dd) Precious resources must be focused on safe public delivery of ED care and not on the privatization of DH.

Emergency physicians must embrace leadership and stewardship roles in DH, to ensure that the most effective initiatives are supported and that precious resources are not diverted to frivolous ventures. As has been emphasized in this report, a set of guiding principles that adhere to the Canada Health Act and support the quintuple aim would be a good starting point.

Visioning the Future with Digital Emergency Medicine

The need for emergency medical services continues to rise, resulting in a shortage of resources and an overwhelming workload for EM practitioners. The situation has been extensively described elsewhere in this report-- overcrowded EDs, long wait times, and limited availability of essential supplies and equipment. DH includes a set of invaluable tools to assist emergency care systems to scale up services, improve patient outcomes, reduce mortality and morbidity and better manage data to deliver health care (ii). DH must not replace in person health care, with its attendant tangible and intangible benefits, but can augment and complement the overall provision of health care.

DH should also be considered as an adjunct to human resources. ED staff can participate actively to integrate and implement DH into the clinical workflow by identifying the “why, what, how” of DH projects and prioritize them in specific purposes.

ED leaders are encouraged to participate in research and implementation of DH in an integrated manner, within the community healthcare system (hospital, family medicine, mental health program, etc.) as well as within provincial, national, and international networks.

Conclusion

Digital and technological innovations are scaling rapidly, and medicine continues to adopt and implement the best of them into every specialty. In a future not too far from now, medicine will be transformed by DH. Metabolomic and genomic findings will change the way we treat and choose medications for patients, for example tailoring pain medications, antibiotics or anti-depressants. AI will accelerate note taking, prescribing (jj), and help monitor patients and detect diseases in early stages. These areas of research will open doors to personalized diagnostic and treatment. Emergency medicine leaders, must, be proactive with integrating these technologies to optimize patient outcomes, while reducing fear, errors and ethical bias.
DH is an inevitability in emergency care. As such, the question is not whether DH will be adopted, but rather how technology can help forge a path to achieve the quintuple aims of improved patient experience, better population outcomes, value for our health dollars, an empowered workforce and health equity for all Canadians. The latter two of these are worth reiterating – if DH proves a burden to providers, and inaccessible to our most vulnerable, this technological revolution will be met with resistance, rather than acceptance. Therefore, understanding both the vast potential and the pitfalls of DH, and choosing future applications and resource allocations wisely, will be imperative.

**Recommendations**

- EM leaders in Canada must work together with all stakeholders to build a DH record system which allows access for both patients and direct healthcare providers.
- To achieve this, health information systems should be integrated at regional, as well as F/P/T levels.
- Emergency physicians must embrace leadership and stewardship roles in DH, to ensure that the most effective initiatives are supported and that precious public resources are not diverted to frivolous ventures or privatization of DH.
- EM specialists should assume key roles in the regulation of DH applications in healthcare by way of legislation and government policies.
- Departments of EM and IM professional societies should collaborate in national and global translational research to best apply digital health’s strengths to EM’s needs.
- EM training and professional development should be reviewed to ensure core competencies related to the use of DH are taught.
- Digital health should be a focus of quality improvement initiatives at hospital EDs and academic departments of ED.
- Appropriate consideration should be given to the varying levels of digital literacy, access, and education in populations in Canada to help prevent barriers to the equitable implementation of digital ED health. (ee,ff)

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