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Reimagining connected care in the era of digital medicine

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Reimagining connected care in the era of digital medicine

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Abstract

The Covid-19 pandemic accelerated the adoption of digital health tools such as telehealth and remote patient monitoring (RPM), which offer exciting opportunities for expanded connected care at a distance. But while the mode of clinicians' interactions with patients and their health data has transformed, the larger framework of how we deliver care is still driven by a model of episodic care that does not facilitate this new frontier. Fully realizing a transformation to a system of continuous connected care augmented by digital technology will require a shift in clinicians' and health systems' approach to care delivery technology and its associated data volume and complexity. In this article, we present a solution that organizes and optimizes the interaction of automated technologies with human oversight, allowing for the maximal use of data-rich technologies while preserving the pieces of medical care considered "uniquely human." We review implications of this "augmented continuous connected care" model for clinical practice, and offer human-centered design-informed next steps to encourage innovation around these important issues.

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Original Manuscript

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Viewpoint

Title: Reimagining connected care in the era of digital medicine

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Abstract

The Covid-19 pandemic accelerated the adoption of digital health tools such as telehealth and remote patient monitoring (RPM), which offer exciting opportunities for expanded connected care at a distance. But while the mode of clinicians' interactions with patients and their health data has transformed, the larger framework of *how we deliver care* is still driven by a model of episodic care that does not facilitate this new frontier. Fully realizing a transformation to a system of continuous connected care augmented by digital technology will require a shift in clinicians' and health systems' approach to care delivery technology and its associated data volume and complexity. In this article, we present a solution that organizes and optimizes the interaction of automated technologies with human oversight, allowing for the maximal use of data-rich technologies while preserving the pieces of medical care considered "uniquely human." We review implications of this "augmented continuous connected care" model for clinical practice, and offer human-centered design-informed next steps to encourage innovation around these important issues.

Keywords

health information technology; telehealth; remote patient monitoring; mHealth; eHealth; digital health; innovation; process model

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The Covid-19 pandemic accelerated the adoption of digital health tools such as telehealth and remote patient monitoring (RPM), allowing for care at a distance in an age of unprecedented health uncertainty and disruption[1]. But while the mode of clinicians' interactions with patients and their health data has transformed, the larger framework of *how we deliver care* has only incrementally shifted. Most healthcare is still delivered in episodes – synchronous moments of connection between clinicians and patients, mediated by discrete hospitalizations, office visits, or calls. But health is *not* episodic; it is a fundamental part of the human condition, experienced regularly and continuously, more akin to a utility (e.g. energy, water, or even education) than a traditional professional service (e.g. tax preparation). The friction in these competing visions of care has contributed to a fragmented, inconsistent healthcare delivery experience; it has also limited the health information technology (HIT) resources, innovations and capital needed to make the world of data-driven continuous care possible.

The rapid adoption of new digital healthcare technologies has begun to dismantle this barrier. The influx of health data from telehealth and RPM has the potential to realize a new framework of medicine – not just of higher quality episodic medicine but of a continuous connected care model that reflects the true interaction of healthcare and the human experience. But while more continuous and complete data from patients can facilitate this new world of care, its introduction into the healthcare landscape has also raised concerns. RPM devices generate more data than a clinician is equipped to manage, and current HIT systems are inadequate for the data curation and visualization required to effectively use this data to help patients[2]. At the same time, there are worries that simply increasing the *volume* of data about a patient does not translate to improved health outcomes, and that more understanding of the *quality* requirements of RPM is needed[3]. Finally, the increased burden on patients and clinicians to *always be connected*, whether to their health or their jobs, has raised concerns about medical overutilization, burnout, and excessive consumerism[4].

To address these challenges, health systems have taken a number of approaches; these include limiting digital access and services, adding new staff, or implementing automated tools like chatbots and AI models to manage the data and its clinical consequences. Ultimately, a solution that *optimizes the interaction of automated technologies with human oversight, both routine and specialized*, will likely prevail, allowing for maximal use of data-rich technologies while preserving the pieces of medical care considered "uniquely" human. Taken together, these new tools and solutions can be viewed as a novel pyramid of healthcare delivery – augmented continuous connected care (Figure 1). As the base, continuous connected care is built on an always "on", automated and often passive, holistic health data capture layer. These diverse data points are integrated and standardized by an algorithmic (or machine learning) layer that can "listen" to and interpret data and either respond autonomously or reduce noise and boost signals to generate more actionable insights for human interpretation. Decisions beyond the scope of this "digital clinician" are routed to the clinical team for management, enabling them to work to the top of their licenses and provide the parts of medical care that benefit most from a human touch – patient education, shared decision-making, and complex medical decision-making.

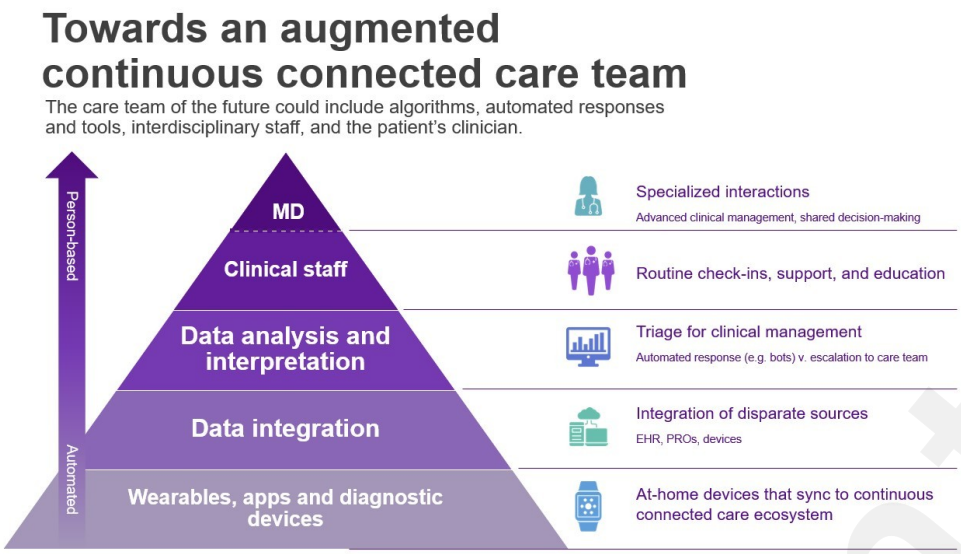

Figure 1. Augmented continuous connected care pyramid.

The implications of this shift to an augmented continuous connected care paradigm are significant. Below we reframe these implications as a set of Design Thinking-informed "how might we" questions to encourage new thinking around these issues[5]. These questions acknowledge both the potential and the challenges of using RPM and other tools to evolve the world of healthcare.

1. How might we use RPM technologies to let patients easily share their "daily life data" without overwhelming their healthcare teams?
2. How might we change how patients and healthcare teams communicate to take advantage of continuous connected care?
3. How might we transform the healthcare workforce to manage this new type of high volume, daily life data?

These "how might we" statements are by no means exhaustive of the scope of challenges facing the future of continuous connected care. Rather, they are designed to inspire healthcare leaders, designers, and clinicians to reimagine these and other key questions, and to begin designing new approaches that unlock the potential of RPM-enabled continuous connected care to improve healthcare delivery in the growing digital age of medicine. The answer to these questions requires improvements in the design, usability, and interoperability of RPM tools to reduce the burden of patient work and empower equitable access to and use of this transformative technology. It will also require careful balancing of the benefits of continuous care with the risks of being "too connected"; new approaches will be needed that help patients and clinicians stay updated on information and make actionable decisions on the key events in their health while protecting themselves and their data. Advances in both HIT architecture and AI will be necessary to make these tools usable for clinical decision-making, supported by learning health systems that can make broader changes in their operations based on data insights. Responding to these challenges will also require organizational and regulatory flexibility to modify healthcare workers' composition and scopes of work; it may require investment in new roles such as RPM "navigators", community health workers and others who manage data and devices in partnership with patients and clinicians. Finally, it will require reform of financial incentives to support the changes in the healthcare workforce and practice

environments needed to manage truly continuous care.

RPM and other digital health technologies are ushering in a transition to a new and exciting model of care, from episodic to continuous and connected. But there are many challenges facing this transition, and how we respond to them will shape the ultimate impact of not only these tools themselves but also of our ability use these technologies to improve healthcare experiences and outcomes.

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Conflicts of Interests

The authors declare they have no conflicts of interest in the research.

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Abbreviations

HIT: health information technology
RPM: remote patient monitoring

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Supplementary Files

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Figures

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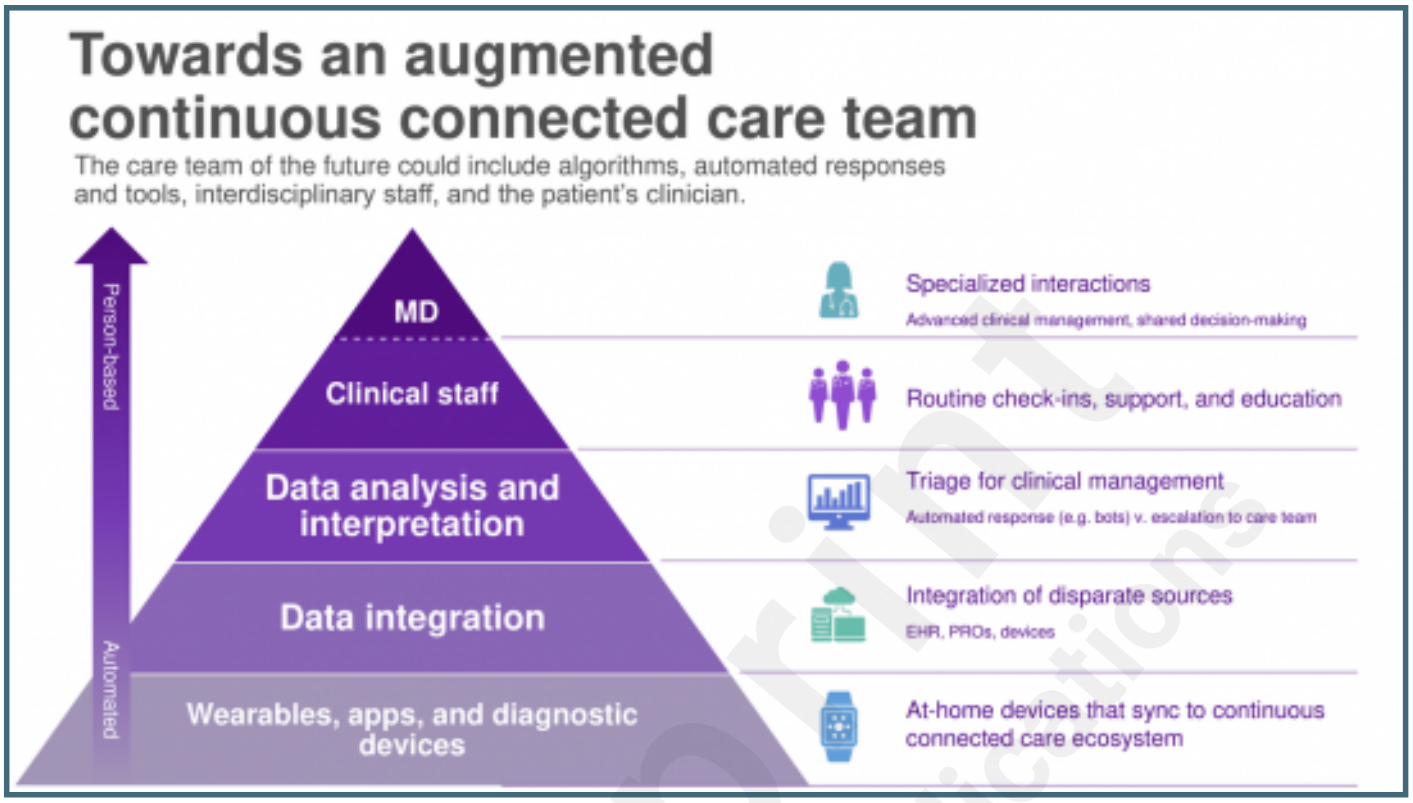
Augmented continuous connected care pyramid.



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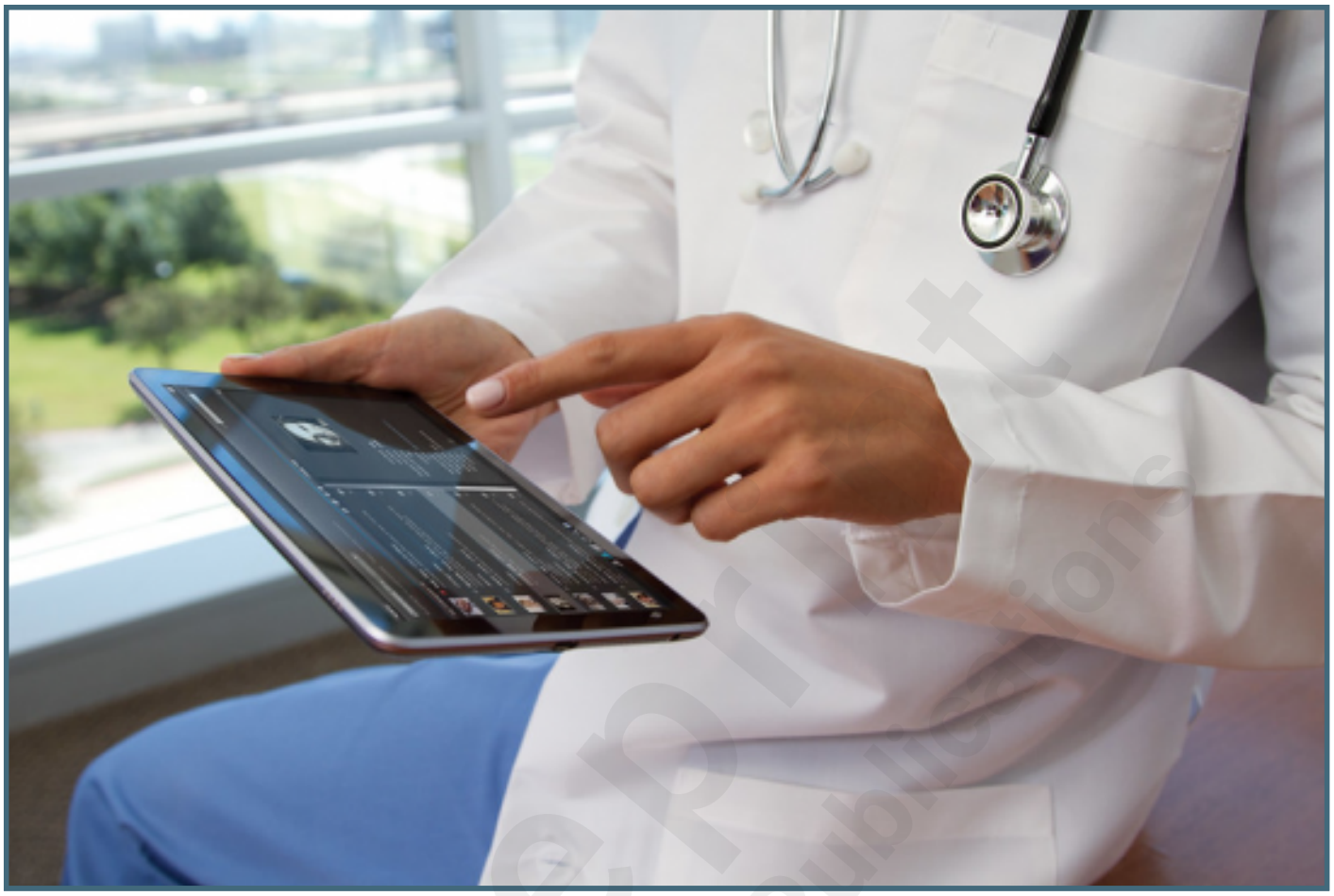
Doctor checking patient charts on iPad.



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