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ARTICLE
INNOVATION

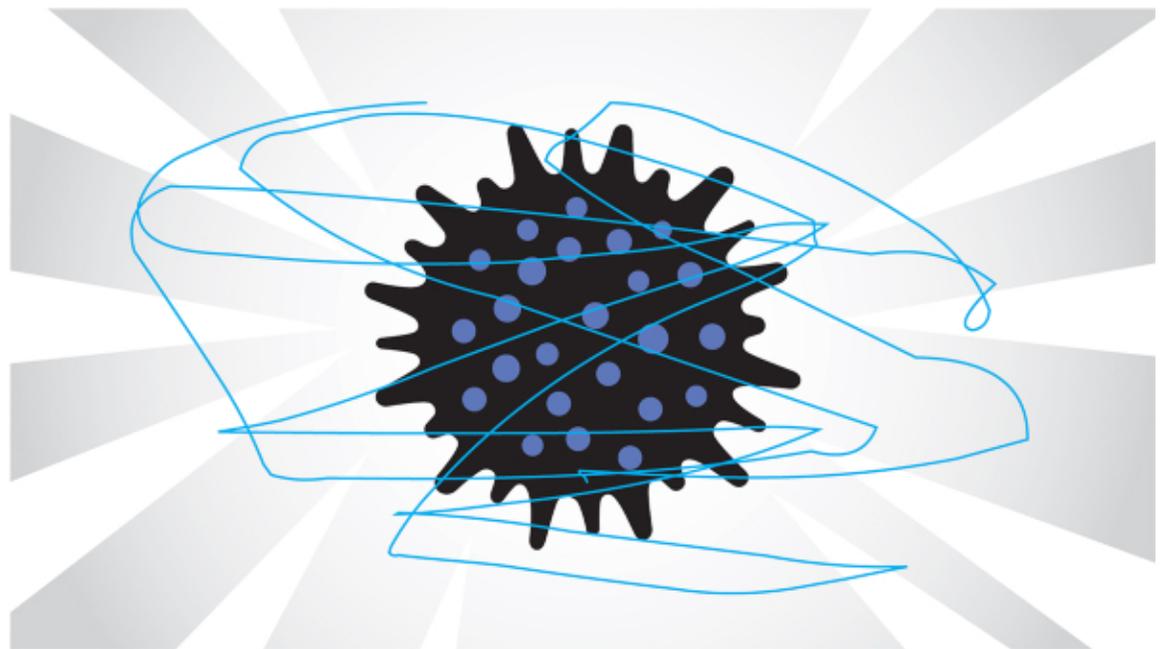# How Hospitals Are Using AI to Battle Covid-19

by Kelley A. Wittbold, Colleen Carroll, Marco Iansiti, Haipeng Mark Zhang and Adam B. Landman

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How Hospitals Are Using AI to Battle Covid-19

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HBR STAFF

On Monday March 9, in an effort to address soaring patient demand in Boston, Partners HealthCare went live with a hotline for patients, clinicians, and anyone else with questions and concerns about Covid-19. The goals are to identify and reassure the people who do not need additional care (the vast majority of callers), to direct people with less serious symptoms to relevant information and virtual care options, and to direct the smaller number of high-risk and higher-acuity patients to the most appropriate resources, including testing sites, newly created respiratory illness clinics, or in certain cases, emergency departments. As the hotline became overwhelmed, the average wait time peaked at 30 minutes. Many callers gave up before they could speak with the expert team of nurses staffing the

hotline. We were missing opportunities to facilitate pre-hospital triage to get the patient to the right care setting at the right time.

The Partners team, led by Lee Schwamm, Haipeng (Mark) Zhang, and Adam Landman, began considering technology options to address the growing need for patient self-triage, including interactive voice response systems and chatbots. We connected with Providence St. Joseph Health system in Seattle, which served some of the country's first Covid-19 patients in early March. In collaboration with Microsoft, Providence built an online screening and triage tool that could rapidly differentiate between those who might really be sick with Covid-19 and those who appear to be suffering from less threatening ailments. In its first week, Providence's tool served more than 40,000 patients, delivering care at an unprecedented scale.

Our team saw potential for this type of AI-based solution and worked to make a similar tool available to our patient population. The Partners Covid-19 Screener provides a simple, straightforward chat interface, presenting patients with a series of questions based on content from the U.S. Centers for Disease Control and Prevention (CDC) and Partners HealthCare experts. In this way, it too can screen enormous numbers of people and rapidly differentiate between those who might really be sick with Covid-19 and those who are likely to be suffering from less threatening ailments. We anticipate this AI bot will alleviate high volumes of patient traffic to the hotline, and extend and stratify the system's care in ways that would have been unimaginable until recently. Development is now under way to facilitate triage of patients with symptoms to most appropriate care setting, including virtual urgent care, primary care providers, respiratory illness clinics, or the emergency department. Most importantly, the chatbot can also serve as a near instantaneous dissemination method for supporting our widely distributed providers, as we have seen the need for frequent clinical triage algorithm updates based on a rapidly changing landscape.

Similarly, at both Brigham and Women's Hospital and at Massachusetts General Hospital, physician researchers are exploring the potential use of intelligent robots developed at Boston Dynamics and MIT to deploy in Covid surge clinics and inpatient wards to perform tasks (obtaining vital signs or delivering medication) that would otherwise require human contact in an effort to mitigate disease transmission.

AI Initiatives are Already Emerging

Several governments and hospital systems around the world have leveraged AI-powered sensors to support triage in sophisticated ways. Chinese technology company Baidu developed a no-contact infrared sensor system to quickly single out individuals with a fever, even in crowds. Beijing's Qinghe railway station is equipped with this system to identify potentially contagious individuals, replacing a cumbersome manual screening process. Similarly, Florida's Tampa General Hospital deployed an AI system in collaboration with Care.ai at its entrances to intercept individuals with potential Covid-19 symptoms from visiting patients. Through cameras positioned at entrances, the technology conducts a facial thermal scan and picks up on other symptoms, including sweat and discoloration, to ward off visitors with fever.

Beyond screening, AI is being used to monitor Covid-19 symptoms, provide decision support for CT scans, and automate hospital operations. Meanwhile, Zhongnan Hospital in China uses an AI-driven CT scan interpreter that identifies Covid-19 when radiologists aren't available. China's Wuhan Wuchang Hospital established a smart field hospital staffed largely by robots. Patient vital signs were monitored using connected thermometers and bracelet-like devices. Intelligent robots delivered medicine and food to patients, alleviating physician exposure to the virus and easing the workload of health care workers experiencing exhaustion. And in South Korea, the government released an app allowing users to self-report symptoms, alerting them if they leave a "quarantine zone" in order to curb the impact of "super-spreaders" who would otherwise go on to infect large populations.

Digital Transformation Now

The spread of Covid-19 is stretching operational systems in health care and beyond. We have seen shortages of everything, from masks and gloves to ventilators, and from emergency room capacity to ICU beds to the speed and reliability of internet connectivity. The reason is both simple and terrifying: Our economy and health care systems are geared to handle linear, incremental demand, while the virus grows at an exponential rate. Our national health system cannot keep up with this kind of explosive demand without the rapid and large-scale adoption of digital operating models.

While we race to dampen the virus's spread, we can optimize our response mechanisms, digitizing as many steps as possible. This is because traditional processes — those that rely on people to function in the critical path of signal processing — are constrained by the rate at which we can train, organize, and deploy human labor. Moreover, traditional processes deliver decreasing returns as they scale. On the other hand, digital systems can be scaled up without such constraints, at virtually infinite rates. The only theoretical bottlenecks are computing power and storage capacity — and we have plenty of both. Digital systems can keep pace with exponential growth.

Importantly, AI for health care must be balanced by the appropriate level of human clinical expertise for final decision-making to ensure we are delivering high quality, safe care. In many cases, human clinical reasoning and decision making cannot be easily replaced by AI, rather AI is a decision aid that helps human improve effectiveness and efficiency.

Digital transformation in health care has been lagging other industries. Our response to Covid today has accelerated the adoption and scaling of virtual and AI tools. From the AI bots deployed by Providence and Partners HealthCare to the Smart Field Hospital in Wuhan, rapid digital transformation is being employed to tackle the exponentially growing Covid threat. We hope and anticipate that after Covid-19 settles, we will have transformed the way we deliver health care in the future.

Kelley A. Wittbold, MD, is an emergency medicine attending physician at Massachusetts General Hospital and an administrative fellow specializing in digital health, emergency telemedicine, and emergency operations management.

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Marco Iansiti is the David Sarnoff Professor of Business Administration at Harvard Business School, where he heads the Technology and Operations Management Unit and the Digital Initiative. He has advised many companies in the technology sector, including Microsoft, Facebook, and Amazon. He is a coauthor (with Karim Lakhani) of the book *Competing in the Age of AI* (Harvard Business Review Press, 2020).

Haipeng Mark Zhang, DO, is a palliative care and clinical informatics attending physician at Brigham and Women's Hospital and Dana-Farber Cancer Institute. He is the medical director of the Brigham and Women's Digital Innovation Hub and focuses on the application and creation of digital tools for clinicians, staff, and patients at Brigham Health and throughout the Partners HealthCare enterprise.

Adam B. Landman, MD, is an emergency medicine and clinical informatics attending physician at Brigham and Women's Hospital, where he also serves as vice president and chief information and digital officer. He is responsible for developing system-wide strategic IT initiatives, with the goal of evolving the next generation of information systems across the Brigham Health enterprise.