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From Farming to Patient Care: Dr. John Halamka Advocates for AIoT



AS CIO OF *Beth Israel Deaconess Medical Center, and the head of its technology innovation center, Dr. Halamka sees endless possibilities for improving patient care by combining artificial intelligence and the internet of things.*



Dr. John Halamka spends his days actively seeking applications for emerging technologies. This might seem obvious, considering his job as CIO of Beth Israel Deaconess Medical Center (BIDMC) in Boston, MA, and director of the BIDMC's Health Technology Exploration Center (HTEC). But his passion for technology—and its real-world, right-now application—isn't just spurred by his career; it's an integral part of his personal life, too.

Technology is central to Unity Farm Sanctuary in Sherborn, MA, which Halamka and his wife, Kathy, founded in 2016 to rescue animals and educate the public about sustainable farming. Every barn on the 60-acre plot is covered by a camera network (see Unity Farm Sanctuary's live "Alpaca Cam"¹) and a smart thermostat, technology that gathers data and sends updates to Halamka. For example, if the sensors detect that the food freezer in the horse barn is open, Halamka will get a text alert. His system is also equipped with AI (artificial intelligence), which is trained to distinguish between a human and an animal, and notifies Halamka of intruders. Those innovations enable the Halamkas to keep closer tabs on the animals' well-being and run their facility more efficiently.

Unity Farm is an example of how AIoT—the combination of AI and the internet of things (IoT)—can have big impacts in unexpected areas, such as in farming. Halamka pursues this passion for applied technology with equal enthusiasm in his professional life, and his involvement in HTEC² provides ample opportunities to do just that. Launched in May 2018, the center explores emerging technologies such as AIoT to speed innovation in health care.

Approaching Innovation to Ensure Implementation

HTEC is designed to function like a startup incubator: identify emerging technologies, test to see which are applicable, and share those findings with hospitals worldwide. AI and IoT are top areas of focus for the team.

Patient monitoring is a common application of IoT devices in healthcare³, and Halamka's team is testing this application to prevent post-hospital-stay readmission, a costly prospect (tens of thousands of dollars in hospital resources) that impacts 20 percent⁴ of patients. In the case of patients hospitalized for congestive heart failure, for example, analysis shows that rapid weight gain after their release is an early warning sign of readmission. HTEC is testing a smart scale that will send weight data through the patient's smartphone to the care team, flagging danger before another hospitalization is necessary. That direct link to the care team can reduce lag times in communicating complications, and spur timely changes in treatment plans that "nip them in the bud" before they're critical. This early action can also save costs that would otherwise ripple through the provider network.

"Orchestrate your wellness, rather than wait for your sickness," Halamka advocates. In the future, Halamka hopes that HTEC will incorporate AI into patient monitoring to continue improving preventive care with a holistic AIoT approach. As devices like the scale gather more data, AI could start to learn which voice prompts homebound patients respond to most effectively, or which care regimens, lifestyle modifications or medication changes are most effective in preventing this post-heart-failure weight gain. In addition to learning, adding AI to the IoT-enabled patient monitoring can introduce automation—such as delivering the appropriate medication to the patient—to further improve outcomes and manage the overall cost of those outcomes.

With AIoT Promise Comes Privacy and Data Challenges

HTEC's goal for all technologies it tests is to ensure quick implementation in hospitals, a focus that Halamka says differentiates HTEC from other medical innovation centers. Many follow the objective to "find the future," but there's no built-in constituency at the hospital ready to implement that future. HTEC avoids this by evaluating solutions in collaboration with hospital staff in the context of existing operations.

Halamka says that when his team finds that a technology can't yet be implemented in hospitals, privacy concerns and data accuracy are often to blame.

"Everything I do in all of my tech is opt-in consent," he says of the privacy concerns. And while most health care systems have experience protecting data through HIPAA compliance and traditional medical privacy procedures, some have encouraged patients to access records⁵ through vulnerable social media networks. Halamka says HTEC has several collaborations in progress with cybersecurity firms to find ways to make patient data more secure.

And even if the data is secure, HTEC, along with many organizations⁶ looking to leverage AI and IoT, must clean up disorganized or disparate data. Halamka adds that as millions of fitness devices transmit data, for example, sweat can disrupt a heart rate monitor. Does that mean AI should call an ambulance? Of course not—but unless a data scientist can train the algorithms in the AI to know the difference, the scenario shows some of the ways that AI can't always be left completely on "autopilot" and often might be more accurately thought of as job-enhancing, as opposed to job-replacing technology.

"A big challenge we have right now in health care is too much data and not enough wisdom," he says. "Figuring out how to separate the wheat from the chaff may take a lot of machine learning."

HTEC hopes to help drive this process, particularly as evidence already suggests major benefits of AI, IoT and AIoT in health care. AI, for one, could improve health outcomes by 30 to 40 percent⁷, while applications in IoT are already impacting treatment and diagnosis, and reducing costs⁸. With the rising AIoT⁹, there's even more potential to leverage. Halamka advises adopting simpler, workable innovations today—like the smart scale that HTEC is testing—and looking to the near future for robust AIoT applications that not only gather data, but use machine learning to take cost-saving—and potentially life-saving—action.

“Do it internally, do it to solve a business problem,” says Halamka. After all, he adds, why waste time daydreaming of sentient robots driving flying cars when you can help and protect your loved ones (and your farm) with technology right now?

Learn more about the AIoT

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Sources:

1. [Unitv Farm Sanctuarv’s live “Albaca Cam”](#)
2. [HTEC](#)
3. [Patient monitoring is a common application of IoT devices in healthcare](#)
4. [Impacts 20 percent of patients](#)
5. [Encouraged patients to access records through vulnerable social media networks](#)
6. [Along with many organizations](#)
7. [Improve health outcomes by 30 to 40 percent](#)
8. [Impacting treatment and diagnosis, and reducing costs](#)
9. [Rising AIoT](#)

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