Leveraging data from wearable medical devices

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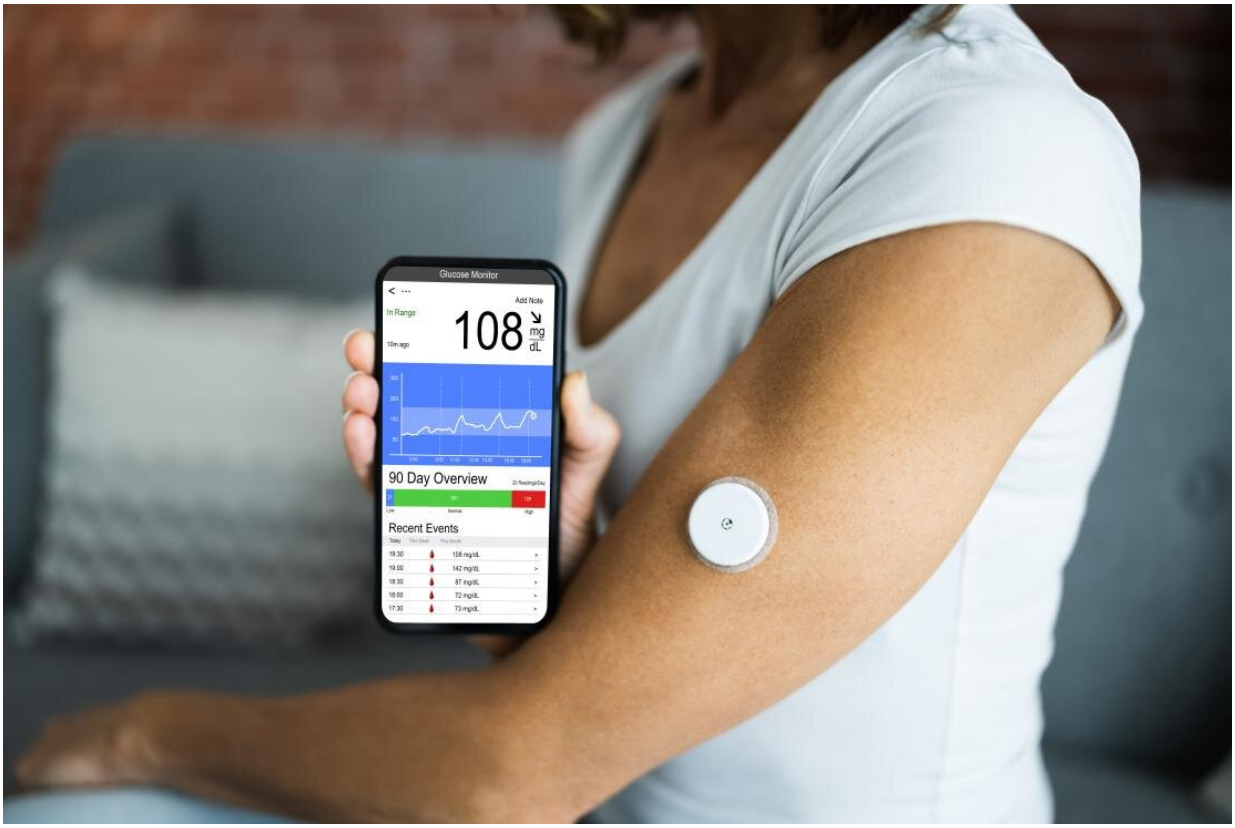

Researchers with the Augmented Health Lab are leveraging data from wearable medical devices to treat diabetes and other diseases to improve health outcomes. Credit: Shutterstock

Diabetes, and other chronic conditions like cancer or cardiovascular

disease, require a lifetime of management.

In recent years, a slew of wearable devices such as glucose monitors, activity trackers, heart rate monitors, and pulse oximeters have been adopted by patients and health care providers to track and manage these conditions more effectively. These devices are also a rich source of data that can be analyzed to better understand the factors and behaviors that lead to improved health outcomes.

"But they're vastly underutilized," says Temiloluwa Prioleau, assistant professor of computer science and co-director of the Augmented Health Lab, which is focused on bridging this gap.

Ubiquitous sensors, which monitor health-related data and behaviors as people go about their day, could truly hold the key to understanding and informing good management practices, says Prioleau. The key challenge lies in extracting meaningful information from the deluge of data these devices collect.

In a recent study published in *npj Digital Health*, Prioleau and computer science graduate student Abigail Bartolome use machine learning techniques to tackle the problem. They mine data from continuous glucose monitors and insulin pumps, which are devices used by people with diabetes, to learn patterns in the data and understand what diabetes outcomes are related to these patterns.

For example, in their study they find that when a patient's glucose levels are in the target range for more than 70% one day, they have a higher likelihood of remaining within range for a large part of the next day as well. The chance of a good outcome for the next day was even higher when their mealtime insulin doses were within an observed range.

These results are intuitive and align with the findings from prior work

involving predictors of blood glucose control, says Bartolome. The study demonstrates that their computational framework successfully extracts digital biomarkers—quantifiable factors that capture health management behaviors and predict future outcomes—from multiple streams of data related to conditions like diabetes.

"We can now connect other lifestyle and activity data with the information we have to gain richer and more nuanced insights into daily behaviors that can lead to good or poor glucose control," says Bartolome.

A user study that integrates data from activity trackers that record step counts, sleep, and other information into the mix to identify biomarkers that are connected to people's everyday decisions is now underway.

Armed with insights gleaned from the data, researchers hope to support personalized diabetes management, not just for people who use wearable devices, but even for those who don't have access to them.

"The long-term vision," says Prioleau, "is to benefit people who don't have access to advanced diabetes technology."

More information: Abigail Bartolome et al, A computational framework for discovering digital biomarkers of glycemic control, *npj Digital Medicine* (2022). DOI: 10.1038/s41746-022-00656-z

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