

Integrating Mobile Fitness Trackers Into the Practice of Medicine

Abstract: *Mobile fitness trackers are increasingly used by patients as a means to become more involved in their own self-care; however, these devices measure disparate outcomes that may have equivocal relevance to true health status. It is vital for physicians to interpret both the quality and accuracy of the information that these trackers provide, and it is important to delineate which role, if any, these devices may serve in promoting quality patient care in the future. Potential benefits of mobile fitness trackers include the ability to motivate patients toward a healthier lifestyle, to develop a community of like-minded individuals seeking to improve their health, as well as to create an environment of sustainability and accountability for long-term promotion of health maintenance. However, limitations include the fact that mobile fitness trackers are not regulated by the Food and Drug Administration, that the employed metrics are not necessarily the best surrogates for true health status, and that the accuracy of measured endpoints has not yet been proven. As mobile fitness trackers both continue to rise in popularity and become*

increasingly sophisticated, physicians must be equipped to interpret and use this technology to better serve patients within an ever-changing, more technology-reliant health care system.

Keywords: chronic disease management; fitness; outpatient monitoring

Perrelet actually created the first functional pedometer, later to be introduced to the United States by Thomas Jefferson.

For nearly 200 years since the time of Jefferson, there had been little growth in the field of personal activity tracking, until 1981, when the first heart rate monitor used for fitness was developed.

“... by continually monitoring and cataloguing activity metrics, modern fitness trackers may serve a role in patient-directed self-monitoring.”

The concept of a mobile fitness tracker, a portable device that continuously logs activity metrics, can be traced in its earliest form to the Roman engineer Vitruvius, who originally designed an odometer for use on chariots. During the Italian Renaissance, Leonardo da Vinci attempted to reconstruct this Vitruvian odometer, while at the same time drawing plans for a pedometer for potential use by soldiers.¹ However, it was not until 1780 that the Swiss horologist Abraham-Louis

Today, there are numerous portable devices used in both clinical and nonclinical settings which incorporate increasingly sophisticated technology such as accelerometers, altimeters, as well as the ability to monitor heart rate, respiratory rate, and even sleep activity.

Between April 2013 and March 2014, roughly 3.3 million mobile fitness trackers were sold in the United States alone,² with a predicted 22 million sales worldwide.³ It is also projected that by 2018, there could be more than 50 billion

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dollars worth of mobile fitness tracker sales in the United States.⁴ While there is not yet any published data revealing the frequency at which patients bring their fitness tracker data to their primary care providers for analysis, it is clear that those who do use mobile fitness trackers self-report improved compliance with behavioral modifications such as increasing the number of steps taken each day.⁵ With rising popularity and increasing market appeal, the modern mobile fitness tracker is certainly gleaning the interest of consumer and physician alike, and while still being a relatively nascent technology, there is potential for this technology to disrupt the traditional practice of outpatient medicine.

More than a third (34.9%) of adults living in the United States suffer from obesity, which is a known risk factor for insulin-dependent diabetes, hypertension, and a host of other chronic medical conditions such as metabolic syndrome.^{6,7} Since obesity and metabolic syndrome are primarily a function of daily lifestyle choices, the power of prevention lies in the synergistic efforts of both patients and primary care physicians, who play a critical role in encouraging lifestyle modification while managing patient progress over the long term.

As clinicians are well aware, patients who are proactive in the management of their chronic medical conditions are more likely to exhibit lasting positive health outcomes,⁸ and by continually monitoring and cataloging activity metrics, modern fitness trackers may serve a role in patient-directed self-monitoring. If used as a component of a physician-led, multidisciplinary treatment approach, they may actually facilitate patient compliance with physician recommendations and ultimately allow patients to more effectively prevent or manage their own chronic medical conditions on a routine basis in the outpatient setting.⁹

In addition to potentially optimizing the outpatient management of chronic medical conditions for individual patients, mobile fitness trackers may also

help stem rising national health care costs. The CDC estimates that the management of chronic medical conditions such as obesity, diabetes, and hypertension accounts for roughly 75% of total health care spending in the United States. Preventing obesity is therefore of great interest not only for the direct benefits to patient health but also for the indirect benefits to the health care system and the economy. The Centers for Disease Control and Prevention's National Center for Chronic Disease Prevention and Health Promotion spends nearly 1 billion dollars annually for research into the prevention and management of obesity and its sequelae,¹⁰ and by addressing this very issue, the routine implementation of mobile fitness trackers in the outpatient setting could have profound effects in reducing national health care costs.

While motivated patients would likely benefit from access to a mobile fitness tracker for the purpose of monitoring and then improving on particular activity metrics in order to prevent or manage chronic medical conditions such as obesity, less motivated patients may be less inclined to self-monitor on the outpatient basis. However, since fitness trackers have the ability to integrate into cloud technology, it becomes possible for patients to compare their metrics and progress with personally selected peers, which through competition and reciprocal emotional support can provide a sense of personal empowerment as well as improve motivation.^{11,12} Some devices may even be equipped with movement reminder settings that are activated after a period of inactivity, which in the setting of real time data input from peers can truly encourage behavioral changes throughout the day.

In the outpatient setting, mobile fitness trackers can collect a serial log of patient data points that can be extrapolated into meaningful trends over time. This may prove useful to primary care physicians attempting to monitor and manage a patient's compliance with specific lifestyle regimens. Currently, lifestyle adjustments for the management of obesity, diabetes, or metabolic syndrome

are done on discrete office visits that rely heavily on a patient's anecdotal recollections as well as interval measurements taken in the office at the time of the appointment. However, the stream of data points provided by fitness trackers, combined with the patient's history, physical examination, and laboratory and imaging studies, has the potential to offer a much more comprehensive approach to lifestyle management in the outpatient setting and may prove not only useful but potentially vital for the primary care physician attempting to prevent or manage chronic medical conditions such as obesity.

While there is certainly great potential for the incorporation of mobile fitness trackers into the practice of outpatient medicine, there are currently also many limitations. For instance, while patients may enthusiastically bring data from their fitness trackers to their primary care appointments, the clinician may struggle with how to interpret the results.

To start, the actual measurement of desired endpoints currently proves to be a challenge. For example, how does the motivated woman with osteoporosis use a fitness tracker to record weightbearing exercises, given that current fitness trackers cannot accurately capture most types of resistance training? Also, while counting calories using a fitness tracker may help limit total caloric consumption, it does not account for the source of calories (fat, protein, or carbohydrate). Undoubtedly, to be relied on as a useful preventive medicine tool, fitness trackers must first record the most relevant data points. To date, these devices are not approved by the Food and Drug Administration, and there is no regulatory body of experts to determine which data points should be tracked in the outpatient setting for particular chronic conditions.

Once the ideal metrics are defined, agreed on, and then systematically monitored, it then becomes crucial to be able to rely upon the accuracy of these clinical data points. There are currently many methods and algorithms for calculating activity levels and caloric

consumption, but to become a trusted tool that can be effectively incorporated into the practice of outpatient medicine, mobile fitness trackers will need to employ a standardized and evidence-based approach to generating the data that they record and report.

Finally, as with any modification to the practice of medicine, it is important to delineate the issue of physician liability. Would primary care physicians be charged with monitoring activity metrics alongside their patients, akin to cardiologists remotely monitoring cardiac rhythms? Also, would physicians be held accountable for patient performance as defined by the outpatient catalogue of their recorded activity metrics? The question of physician liability and responsibility is especially salient given the parameters set forth by the value-based payment modifier policies of the Affordable Care Act, which provide incentives for primary care physicians with regard to the management of chronic medical conditions.¹³

In conclusion, with the increased popularity and sophistication of mobile fitness trackers, the potential for revolutionizing the prevention and management of outpatient chronic disease is immense. However, the

technology must first be vetted and standardized, and issues of liability more clearly defined, before being relied on as a fundamental component in the field of outpatient medicine. **AJLM**

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