



Article

Making Smartwatches one of the Main Tools in Medicine

Khasanov Bobur Gafurjonovich¹

1.INHA University in Tashkent, Tashkent, Uzbekistan

* Correspondence: khasanovbobur131@gmail.com
(0009-0005-7529-0158)¹

Abstract: Smartwatches continue to gain widespread popularity, with an increasing number of individuals relying on them for both convenience and comprehensive health monitoring. This article explores the potential of smartwatches to become key tools in medicine, focusing on their advanced sensor technology and data analytics capabilities. By continuously tracking parameters such as heart rate, ECG, blood oxygen saturation, and physical activity, smartwatches provide invaluable data for early diagnosis and personalized treatment. We discuss the integration of smartwatch data with electronic health records and telemedicine platforms, enabling real-time monitoring and remote patient management. Challenges related to data security and accuracy are also examined. Our findings suggest that smartwatches have the potential to revolutionize healthcare by enhancing preventive measures, improving patient outcomes, and fostering a more proactive approach to health management.

Keywords: Smartwatch, Fitness Trackers, Wearable devices, Health Parameters, Health Monitoring, Physical Activity, Remote Patient Monitoring, Telehealth, Telemedicine, Apple Watch, Sensors, Artificial Intelligence (AI), AI-Assistance, Sleep Apnea, Arrhythmia, Atrial Fibrillation (AFib), Insomnia, Hypoxemia.

Citation: Khasanov B.G. Making Smartwatches one of the Main Tools in Medicine. Central Asian Journal of Mathematical Theory and Computer Sciences 2024, 5(3), 274-277.

Received: 16th July 2024

Revised: 23rd July 2024

Accepted: 30th July 2024

Published: 10th August 2024



Copyright: © 2024 by the authors. Submitted for open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>)

Introduction

The mobile technology market registers a tremendous increase in smartwatches, which is evident by the way they have transformed from simple fitness trackers into advanced health monitoring devices. With millions of people worldwide adopting these wearable devices, smartwatches are increasingly recognized for their potential to revolutionize healthcare and proved every single person that they can be something more than just a typical watch. These smartwatches are fitted with sensors that constantly monitor several health parameters including heart rate, electrocardiographs (ECG), blood oxygen levels and sleep patterns as well as physical activities like steps, calories burned, and distance traveled. This capability not only empowers individuals to take a responsibility for their own health, but also provides healthcare professionals with valuable data to enhance patient care [1],[2],[3].

The adoption of smartwatches in the medical field signifies a big transformation towards personalized and preventive medicine. The ability to detect diseases in their early stages, constantly monitor one's health and manage patients remotely are some of the functions of smartwatches that can play a crucial role in improving health outcomes and reducing the strain on healthcare systems. It is essential to explore the full potential of smartwatches, and analyze their advantages, and challenges in the medical field, as their complexity increases and we see more people using them [4],[5].

The article looks at the role of smartwatches in modern medicine, examining their capabilities and suggesting how they can be improved to enable them to become one of the main tools in medicine as well as highlighting on their influence on an individual's health status. Consequently, it is important to consider how smartwatches are able to help identify diseases earlier, monitor patients with chronic conditions continuously and improve general patient experience. It will also consider issues such as accuracy of data, privacy concerns and integration of information from smart watches into existing healthcare systems. The article aims at presenting smartwatches as having a potential for a revolution thus making them indispensable elements in future healthcare.

The Current State of Smartwatches in Healthcare

Nowadays, smartwatches have rapidly evolved into essential tools in the healthcare industry. These are not only fitness trackers any longer; they can now be used for advanced health monitoring, such as tracking heartbeat, sleep patterns, blood oxygen levels and performing ECGs. Smartwatches now can even detect irregular heartbeat rhythms such as atrial fibrillation which provide preliminary warnings and crucial health insights to users [11].

Moreover, smartwatches now include functionalities like fall detection and stress level monitoring, enhancing their role in personal health management. The data captured from these gadgets can be easily shared with healthcare providers thus promoting continuous health monitoring and enabling more personalized care plans [12].

Clinical research is reliant on smartwatches as they provide useful information that can be used to analyze trends in health conditions, take care of chronic diseases and establish new ways of treating patients. As smartwatches continue to include enhanced health features, they are becoming an inseparable part of both our daily lives and modern medicine, marking a significant shift in how health data is gathered and utilized.

Advantages of Using Smartwatches in Medicine

Smartwatches are proving to be a useful tool in healthcare for several functionalities like patient monitoring, diagnosing the symptoms of various diseases, and detecting potential health issues. One of the major advantages of smartwatches is their ability to provide continuous, and real-time health monitoring. Using equipped sensors, smartwatches can measure different health parameters including heartbeat, blood oxygen level measurements, sleep patterns and others. Thus, smartwatches simultaneously replace several medical instruments. Another benefit is early detection or prediction of various kinds of illnesses. In fact, there are a large number of diseases that depends on the health metrics that smartwatches are able to measure such as sleep apnea, arrhythmia, insomnia, hypoxemia and many others [7]. So, smartwatches can be used in predicting the risk of developing the illnesses mentioned above. For instance, deviations in heart rate or rhythm can be detected promptly, enabling early intervention and potentially preventing more serious complications.

Last but not least, the convenience of smartwatches and their promotion of patient engagement and awareness make them an ideal tool for daily health monitoring. Users can easily integrate these gadgets into their lives without the need for bulky equipment or frequent doctor visits. Additionally, easy access to health data gives people motivation and power to take control of their well-being.

Studies and Researches

There have been a huge number of studies that have shown promising results. For instance, a study conducted by researchers at Stanford University developed a deep neural network algorithm to predict the risk of developing diabetes using smartwatch data. The algorithm achieved 85% accuracy in predicting diabetes compared to traditional risk factors such as age and BMI, which achieved 75% accuracy [9].

Regarding the study done by researchers at the University of California in San Francisco used decision tree algorithms to predict the risk of developing hypertension using smartwatch data. The algorithm achieved 84% accuracy in predicting hypertension [10].

According to the other research involving smartwatches, their ability to detect atrial fibrillation (AFib). The Apple Heart Study, conducted by Stanford Medicine in collaboration with Apple, involved over 419,000 participants and demonstrated that the Apple Watch could accurately detect AFib. The study found that notifications of irregular pulse patterns had a positive predictive value of 84% for identifying AFib. Participants who received notifications were prompted to consult with a doctor and undergo further testing, confirming the smartwatch's capability to detect serious heart conditions early [6].

Challenges and Limitations

Despite their benefits, smartwatches are not without limitations. Concerns regarding the accuracy of sensor data persist, as false positives and false negatives can occur. Ensuring the reliability of these measurements is crucial for the devices to be trusted in a medical context. Moreover, most people may wear smartwatches inappropriately, which could lead to inaccurate assessments of several health metrics. On top of that, current data privacy and security of smartwatches are not at an enviable level. However, protecting this information from unauthorized access is essential [13]. Last but not least, the cost of smartwatches can be an issue for some individuals, limiting their accessibility. Ensuring that these devices are affordable and accessible to a broad population is crucial for maximizing their impact on public health.

Future Prospects and Innovations

Regarding the future prospects and innovations, emerging technologies hold promise for enhancing the capabilities of smartwatches. Advanced sensors, improved algorithms, and artificial intelligence (AI) integration can provide more accurate and comprehensive health monitoring [8], although they will still require further research works and experiments to prove multiple times that smartwatches are ready to be an inseparable part of medicine. To achieve this result, partnerships between smartwatch manufacturers and healthcare providers can be beneficial and can facilitate the integration of these devices into daily medical practice. Collaboration can also stimulate the development of new applications tailored to specific medical needs. If these actions happen and show excellent results, it could open big doors for transformation of the medical industry [14]. Just imagine, we can measure multiple health parameters with a single tool, healthcare specialists can monitor patients remotely, help doctors make correct diagnoses and which treatment methods to use, and this opens up a lot of other opportunities.

Conclusion

Only a few years ago, it was hard to believe that a smartwatch no larger than a typical watch would be able to make phone calls, send and receive text messages. But now smartwatches have already proved themselves that they can be something more than just a watch, offering continuous health monitoring, early detection of conditions, and enhanced patient engagement. While challenges related to accuracy, and data privacy still remain, advancements in technology and collaboration with healthcare providers can help overcome these obstacles. By leveraging these innovations, smartwatches can play a pivotal role in improving patient care and outcomes, making them a mainstay in the future of healthcare.

References

- Alharbi S, Jayne C, Alharbi NS, et al. (2019). Machine Learning for Automatic Diagnosis of Obstructive Sleep Apnea Through Health Data Analysis Using Smartphones and Smartwatches. *JMIR Mhealth Uhealth*. 2019;7(5). doi:10.2196/13228
- Gao Y, Fu T, Liu H, et al. (2019). Identification of Alzheimer's disease using a smartwatch-based wearable sensing platform: An exploratory pilot study. *Geriatrics & Gerontology International*. 2019;19(11):1063-1067. doi:10.1111/ggi.13794
- Shcherbakova N., Merkel C. (2019). Towards a classification model of smartwatch data for mood-state detection. *Procedia Computer Science*. 2019;160:191-196. doi:10.1016/j.procs.2019.09.042
- Cho Y, Lee S. (2021). An Algorithm for Automatic Health Analysis and Diagnosis through Smartwatch Technology. In: Park JH, Joo S, Kim K, Yang H, eds. *Advances in Artificial Intelligence, Software and Systems Engineering*. Springer Proceedings in Complexity. Springer, Cham; 2021:99-108. doi:10.1007/978-3-030-70715-5_11
- Wang Y, Zhang T, Wang R, et al. (2020). Using Smartwatch Data to Identify Emotional States and Autonomic Nervous System Activity. *IEEE Journal of Biomedical and Health Informatics*. 2020.24(7):2061-2071. doi:10.1109/JBHI.2019.2953961
- Michael R Massoomi and Eileen M Handberg. (2019). Increasing and Evolving Role of Smart Devices in Modern Medicine. doi: 10.15420/ecr.2019.02
- Bence Bogár, Dániel Pető, Dávid Sipos, Gábor Füredi, Antónia Keszthelyi, József Betlehem, Attila András Pandur. (2024). Detection of Arrhythmias Using Smartwatches. *Healthcare* 2024, 12(9), 892; <https://doi.org/10.3390/healthcare12090892>
- Masoumian Hosseini, M., Masoumian Hosseini, S.T., Qayumi, K. et al. (2023). Smartwatches in healthcare medicine: assistance and monitoring; a scoping review. *BMC Med Inform Decis Mak* 23, 248. <https://doi.org/10.1186/s12911-023-02350-w>
- Ramin Ramezani, Minh Cao, Arjun Earthperson, Arash Naeim. (2023). Developing a Smartwatch Based Healthcare Application. *Sensors (Basel)*. 2023 Jul 25;23(15):6652. doi: 10.3390/s23156652.

- Geoffrey H.; José M. Sanchez; Brandon Ballinger* (2018). Passive Detection of Atrial Fibrillation Using a Commercially Available Smartwatch JAMA Cardiol. 2018;3(5):409-416. doi:10.1001/jamacardio.2018.0136
- Jennifer L. Scheid, Jennifer L. Reed, and Sarah L. West* (2023). Is Wearable Fitness Technology a Medically Approved Device? Yes and No. doi: 10.3390/ijerph20136230
- Emelie E Nelson, Morgan A Rousseau, T Austin Black, Mariya N George, and Rashid M Rashid* (2023). Smartwatch Technology in Medicine: A Call for Future Dermatologic Research doi: 10.2196/47252, PMCID: PMC10616727, PMID: 37843896
- Catherine Dinh-Le, Rachel Chuang, Sara Chokshi, and Devin Mann* (2019). Wearable Health Technology and Electronic Health Record Integration: Scoping Review and Future Directions. doi: 10.2196/12861, PMCID: PMC6746089, PMID: 31512582
- Harjeevan Singh Kang, and Mark Exworthy* (2022). Wearing the Future—Wearables to Empower Users to Take Greater Responsibility for Their Health and Care: Scoping Review. doi: 10.2196/35684, PMCID: PMC9330198, PMID: 35830222