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Research Article

Wearable Technology Integration with Healthcare Systems

Satwik Mamidi*

*Corresponding author: Satwik Mamidi, Salesforce Developer, USA, E-mail: m.satwik16@gmail.com

A B S T R A C T

The adoption of wearable technology improved the patient monitoring system by healthcare providers. There is a significant gap in the regular monitoring or tracking system of the patients' health in the healthcare system. In this context, wearable devices are offering a replacement for this gap to monitor vital signs and other health metrics. The transmission of this data into healthcare software provides real-time monitoring and analysis. Wearable technology enables early detection, personalized care and reduces hospital readmissions. This paper outlines the expected benefits of integrating wearable devices with healthcare systems, including better patient outcomes, proactive care and reduced hospitalizations.

Keywords: Wearable Technology, Healthcare, healthcare software, continuous monitoring

1. Introduction

Due to the induction of new technologies in the healthcare industry, it is witnessing a significant shift. The change is prominent in the regular monitoring of the health of patients. In the traditional method, healthcare professionals primarily relied on periodic visits to evaluate the condition of patients[3]. However, it might not capture minute changes in their health. Therefore, wearable technology, including smartwatches, fitness trackers and biosensors offers benefits in continuous monitoring of patients' health status[3]. The market size of the global wearable technology is reaching billions and expected to grow at a CAGR 14.6%[11]. The combination of wearable with healthcare software can offer real-time data on vital signs like heart rate, oxygen levels and blood pressure, potentially notifying healthcare providers regarding the early signs of health issues.

This article examines ways to tackle the problem of irregular patient monitoring by proposing a solution surrounding the integration of wearable technology.
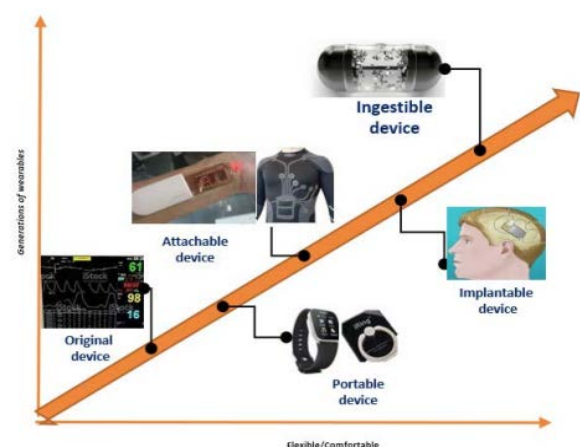

Figure 1: Milestones of Wearable Technological Evolution[1].

2. Background

The market of wearable devices growing rapidly with the increasing adoption of the technology. Further, the benefits of the technology are also a beneficial aspect that contributed to the growth of the industry in the global market **(Figure 2)**. The

wearable devices are diverse ranging from eye-wear, head-wear, foot-wear and others[1]. Among these, the wrist-wear holds a large share of the market at 48%[1]. In addition, the wearable market witnessed significant growth in the market demands, reaching million as of 2021[1].
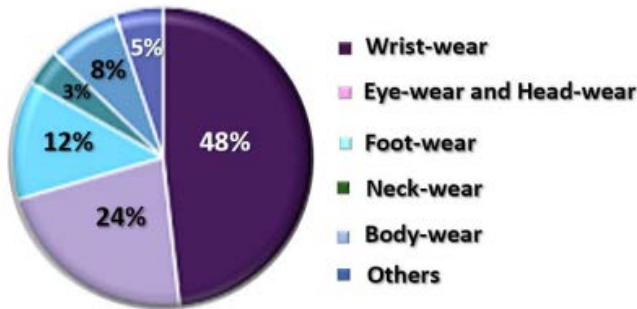

Figure 2: Global Market Share of Wearable Technology[1]

Advancements in wearable technology have posed a significant impact on the healthcare industry due to its ability to track physical activity, sleep patterns, heart rate variability and more[6]. Wearable devices like the Apple Watch, Fitbit and others have gained popularity, allowing individuals to monitor their health metrics in real time[6]. Despite this growth, the integration of this data in the healthcare systems has been slow to progress. The use of wearable devices by consumers quadrupled reaching 33% from 9% between 2014 and 2018[2]. Three-fourths of the patients benefited from the use of wearable devices with features like increased engagement, regular monitoring and understanding of their health condition[2].
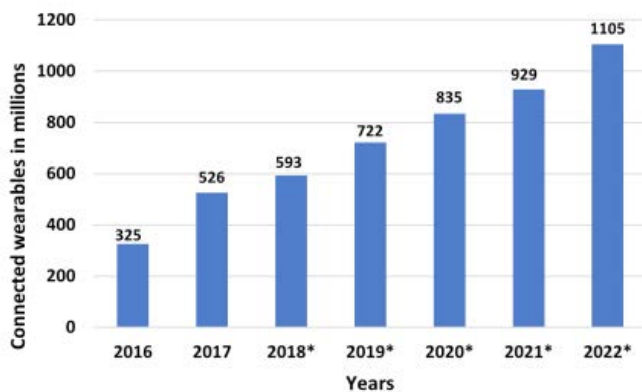

Figure 3: Global Connected Wearable Devices and forecasts

The barriers to adoption of wearable technology, including costs, lack of technical infrastructure or resistance from healthcare providers need to be assessed as well. However, the barriers underscore the benefits of the technology.

3. Problem Statement

The key problem that this article aims to address is the inability of patients to effectively monitor their health between visits to healthcare providers. This article focuses on the difficulty that healthcare systems witness while efficiently tracking patients' health status between clinical visits. Though the traditional method of tracking focuses on the patients' given data from scheduled appointments, it fails to capture minute changes in the health conditions[4]. Patients with chronic diseases with small changes in health indicators often face early signs of deterioration, which gets overlooked by them[4]. The absence of continuous monitoring increases the risk of delayed

interventions, leading to increased hospital readmission rates and worsening patient outcomes.

Figure 4: Varieties of Wearable Devices[1].

4. Proposed Solution

The proposed solution for this problem is the integration of wearable devices with the existing healthcare software to regularly monitor the vitals and health trends of patients. Wearable technological utilization in conjunction with healthcare systems is being proposed to enable continuous monitoring of patient health. Data on real-time basis can be vital for health patterns. It may include heart rate, body temperature and physical activity levels, which can be gathered by wearable devices. It can be analyzed by considering AI and machine learning within an integrated healthcare software system. It may help to detect abnormalities and alert healthcare providers if a patient's condition worsens. The use of AI and machine learning algorithm in the wearable devices would enable enhanced data integration by offering a personalized result.
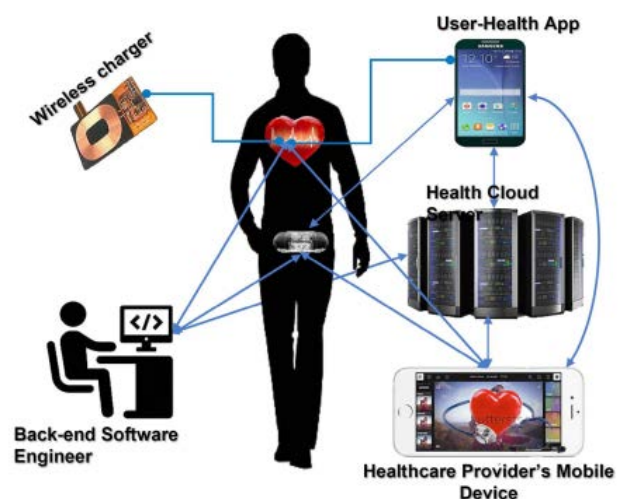

Figure 5: Components of Wearable Devices[1].

5. Methodology

A. Implementation Process

A systematic approach to the implementation or utilization of wearable devices is suggested below.

Selection of Wearable Devices: There is a large range of wearable devices available in the current market and therefore, the selection of the most suited one is necessary. For this purpose, the reliability and accuracy of the devices along with their support to the existing healthcare software are necessary[5]. Further, the ability to track important health measurements like heart rate, oxygen levels, blood pressure and glucose levels must be looked at before purchasing.

Data Integration: The integration of wearable devices with other healthcare gadgets is an important step. It will help in integrating the data or creating an interface that makes the real-time transfer of data easy[5].

Pilot Testing: Pilot study offers an initial understanding of the integration of devices or technologies among a wider audience. Thus, a pilot study based on 15 patients will be conducted to gather their feedback and test the quality or the benefits of the products in respect to the patients.

Training of Patients: The successful rollout of the wearable devices will require significant understanding from the patients about the products. Though the demands of the devices highlight the comprehensive understanding of the patients, there is scope for further improvements. This training program will ensure successful achievement of the accuracy, user-friendliness and overall effectiveness features of the system.
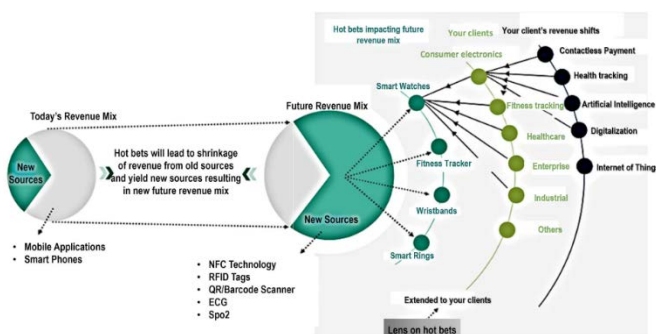

Figure 6: Global Demands of Wearable Devices[1].

Implementational Consideration

To yield the benefits of the devices, there is a need to consider certain areas during the use, which are as follows.

Data Privacy: Ensuring the secure storage and transmission of patient data is crucial during the successful integration of wearable devices into the healthcare system. Adherence to data security regulations of General Data Protection Regulations (GDPR) can ensure success in the secure encryption and integration of wearable devices[10]. The methods suggested by these regulations will be applied to ensure compliance with data privacy.

Cost: Though the technology is beneficial in the long term, the associated cost during the use of the system can be a significant barrier to promoting the use by patients[8]. Therefore, there will be a need to spread awareness of the upfront cost and make the patients understand about the long-term benefits.

Regular Adherence: Though there is a significant growth in the demands, the patients do not share a similar understanding of the use of technology in their healthcare system[10]. Thus, the patients must be educated about the benefits, features and usability of the devices along with the need for consistency.

6. Expected Results

The integration of wearable technology with other software or activities of the healthcare system will lead to better results for patients[8]. This technology will enable continuous monitoring, earlier interventions and customized care plans[9]. Continuous heart failure patients utilizing wearable devices have led to superior outcomes by decreasing hospital readmissions[9]. Further, the use of technologies like AI algorithms helps in the analysis of data collected from wearable devices, leading to better or more accurate prediction of health deterioration. Therefore, the integration of technology will allow proactiveness in the healthcare.

A real-time example of such results is the use of wearable devices at the Mayo Clinic, which allow individuals with chronic heart conditions to biosensors and monitor their vital signs[7]. The system alerts healthcare providers to any significant health changes, reducing the need for frequent hospital visits and improving remote patient management[7]. Overall, the benefits or positive results of the proposed solution is diverse and multifaceted **(Figure 7)**.
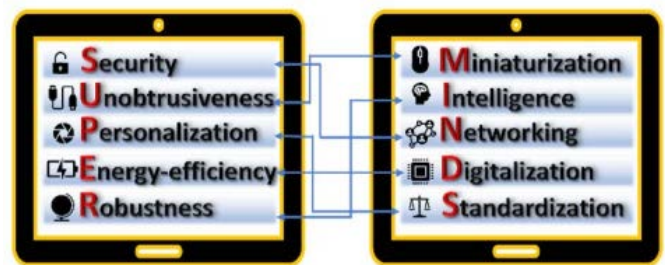

Figure 7: Benefits of Wearable Devices[1].

7. Conclusion

Through evaluating all the facts associated with the study it has been demonstrated that the integration of wearable technology into healthcare systems offers a significant solution to the problem. It may help to mitigate the issue of ongoing patient monitoring outside of clinic visits. It can be perceived that with the use of data from wearable devices, healthcare professionals will be able to ensure well-being of the patient. They will be able to detect early indications and it certainly allow them to take action before conditions worsen. This approach holds the potential to enhance patient outcomes, reduce hospital readmissions and facilitate more personalized care. Overall, the wearable technologies are suggested to integrate in the global healthcare system to yield the benefits.

8. References

1. Ajakwe SO, Nwakanma CI, Kim DS, Lee JM. Key wearable device technologies parameters for innovative healthcare delivery in B5G network: A review, 2020.

2. Accenture. Accenture Study Finds Growing Demand for Digital Health Services Revolutionizing Delivery Models: Patients, Doctors + Machines, 2018.

3. Xie Y, Lu L, Gao F, He SJ, Zhao HJ, Fang Y, Dong Z. Integration of artificial intelligence, blockchain and wearable technology for chronic disease management: a new paradigm in smart healthcare. Current Medical Science, 2021;41(6):1123-1133.

4. Jiang W, Majumder S, Kumar S, Subramaniam S, Li X, Khedri R, Deen MJ. A wearable tele-health system towards monitoring COVID-19 and chronic diseases. IEEE Reviews in Biomedical Engineering, 2021;15:61-84.

5. Mamdiwar SD, Shakruwala Z, Chadha U, Srinivasan K, Chang CY. Recent advances on IoT-assisted wearable sensor systems for healthcare monitoring. Biosensors, 2021;11(10):372.

6. Bhatia A, Maddox TM. Remote patient monitoring in heart failure: factors for clinical efficacy. International Journal of Heart Failure, 2021;3(1):31.

7. Sanyal C, Stolee P, Juzwishin D, Husereau D. Economic evaluations of eHealth technologies: A systematic review. PloS one, 2018,13(6):e0198112.

8. Adapa A, Nah FFH, Hall RH, Siau K, Smith SN. Factors influencing the adoption of smart wearable devices. International Journal of Human–Computer Interaction, 2018;34(5):399-409.

9. Chang HS, Lee SC, Ji YG. Wearable device adoption model with TAM and TTF. International Journal of Mobile Communications, 2016;14(5):518-537.

10. Ryngaert C, Taylor M. The GDPR as global data protection regulation? 2020.

11. GVR, Wearable Technology Market Size: Share & Trends Analysis Report by Product. Segment Forecasts, 2021.