

OPTIMIZING WEARABLE HEALTH DEVICE IMPLEMENTATION: BALANCING USABILITY, SYSTEM INTEGRATION, AND EFFECTIVE TRAINING IN HEALTHCARE SETTINGS

* Remedios D. David

** Kathy B. Angeles

*** Kenneth O. Lubigan

**** Michelle E. Flores

***** Rey P. Borromeo

***** Christian Ray A. Pasiliao

***** Ana Virginia E. Sta Ana

***** Dandel F. Flores

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Corresponding Author: Remedios D. David; doi:10.46360/cosmos.et.620251019

Abstract

Background: The increasing need for the effective and technology-based healthcare has resulted in the expanded use of the wearable health devices in healthcare facilities. The devices, which monitor the vital signs and health data in real time, have demonstrated a potential to improve the patient outcomes, facilitate early diagnosis, and lower the hospital readmission. Their effectiveness, however, depends on the nurses' willingness and capacity to adopt them into a routine practice. Considerations like the user-friendliness, compatibility with hospital systems, and the existence of adequate training have a large impact on the adoption. Nurses as frontline providers hold the key to ensuring the greatest possible potential for wearable technology and therefore must have their challenges and facilitators considered when implementing it.

Methods: The study utilized a descriptive-correlational quantitative approach, collecting responses from 200 nurses through structured questionnaires distributed via Google Forms. The survey focused on understanding nurses' perspectives regarding wearable health devices, particularly their impact on patient care, clinical decision-making, and the efficiency of daily workflow.

Result: The results are that the nurses tend to have a favorable view of the wearable health devices, specifically the usability, integration into the systems, and worth of training. They see these tools as valuable for enhancing patient care and workflow efficiency. There are issues, such as limited availability in the work environment and complexity in integrating devices into the everyday tasks. Despite these barriers, nurses also indicate a very high intention to accept wearable technology, particularly where there is backed up continuous education, peer instruction, and corporate investment. The overall study shows the potential along with practical need needed to establish complete wearable health devices in medical care.

Conclusion: The study emphasizes that the successful adoption of wearable health devices by nurses depends on user-friendly design, effective system integration, and continuous training. While nurses acknowledge the benefits of these technologies in enhancing patient care and workflow, addressing barriers such as accessibility and workflow compatibility is essential. Strengthening support in these areas can lead to more effective use and greater acceptance of wearable health devices in healthcare settings.

Keywords: Wearable Health Device, Implementation, Balancing Usability, System Integration, Effective Training, Healthcare Setting.

Introduction

Wearable health devices, including smartwatches, fitness trackers, and biosensors, are increasingly playing important roles as real-time monitoring tools in contemporary healthcare. Such technologies

provide key information on patients' vital signs and activity levels, helping lead to timely interventions and diagnoses (Lee et al., 2023). Nevertheless, their success relies on usability, system integration without any disruptions, and proper training, particularly for frontline workers like nurses.

*- **Systems Plus College Foundation, Philippines.

- *College of Nursing Pamantasan ng Lungsod ng Pasig Philippines Women's University, Philippines.

*****Philippine Researcher - Israel based, Philippines.

*****Medical Park Blumenhof Breitensteinstäße 10 Bad Feilnbach, Germany.

*****Senior Science Tutor, Oman Ministry of Health Higher Institute of Health Specialties, PgD in Health Services Management Program.

*****Our Lady of Fatima University, College of Nursing, Valenzuela City Campus, Philippines.

Although they have the potential, limitations like inadequate training, technological resistance, and complicated device interfaces postpone adoption (Johnson et al., 2022). Findings suggest that without adequate training and system compatibility, nurses will face additional workload and reduced effectiveness, negating the devices' intended advantages (Smith et al., 2021).

A systematic review of 179 studies with 189 devices and more than 10 million participants showed the dominance of wrist-worn fitness trackers and accelerometers. They were predominantly applied for counting steps, heart rate, and sleep monitoring, with advantages being validation, accuracy, and cost-effectiveness (Grand View Research, 2023). Six dominant uses of wearables, such as method evaluations, population-based research, and big data analysis, were also emphasized by the studies - marking the necessity of structured implementation approaches.

Market trends forecast the wearables market for health devices to stand at \$195 billion in 2027 (Grand View Research, 2023), further highlighting the importance of effective integration. Still, issues like poor interoperability, insufficient organizational support, and data security issues remain (Smith et al., 2021). These are not only impacting adoption but also potentially leading to nurse burnout and decreased quality of care (Garcia & Fernandez, 2022).

Methods

Research Design

This study adopts a descriptive-correlational quantitative research design to investigate the role of wearable health devices in improving patient care, focusing on their adoption by nurses and the resulting clinical outcomes. It seeks to determine the relationship between nurse-specific factors and the utilization of wearable technology, with anticipated outcomes including improved monitoring of vital signs, reduced hospital readmissions, and more efficient workflows. By identifying both the enablers and obstacles to implementation, the research aims to offer empirical support for the broader integration of wearable devices within healthcare environments (Creswell, 2013; Polit & Beck, 2017).

Respondents of the Study

The study engaged 200 nurses who were actively utilizing wearable devices with their patients, with respondents selected according to Slovin's Formula at a 0.05 margin of error. Purposive sampling was employed, and participants were chosen based on relevant characteristics and experiences that aligned with the study's objectives. Data were collected using a structured questionnaire distributed via

Google Forms, and informed consent was obtained electronically to uphold ethical standards.

Instruments of the Study

The research instrument was self-formulated and self-structured, and it underwent content validation to ensure its relevance and clarity. A pilot test was also conducted to assess the tool's reliability in relation to the specific geographical context. The results were submitted for analysis to determine the instrument's consistency and reliability. Expert validation was deemed essential to help researchers address potential challenges affecting task performance and to develop practical solutions to these issues.

Result

Demographic Profile

Age

The majority of respondents were either middle-aged or young adults, with 26.7% falling within the 21 to 31-year-old age group.

Gender

The gender distribution showed a slight imbalance, with females comprising 53.4% of the sample, while the remaining respondents were male.

Years of experience

In terms of work experience, the largest group of respondents (29.8%) had been practicing for 6 to 10 years. This was closely followed by those with 11 to 15 years of experience (28.2%), and those with 1 to 5 years of service (20.6%).

Educational background

With respect to educational attainment, the highest percentage of respondents held Doctoral degrees (38.2%), followed by Bachelor's degree holders (33.6%) and Master's degree holders (28.2%).

Optimizing Wearable Health Device Implementation

Balancing usability

The data indicates that nurses, in general, view the usability and accessibility as critical elements of the adoption of wearable health devices. They concur that the usability improvements and the inclusion of easy-to-use designs would facilitate wider implementation. Moreover, the nurses think that wearable devices are affordable enough to be used widely and that improving the usability would enhance their overall effectiveness. Nevertheless, they reported a neutral attitudes toward the availability of these devices in the workplace, with the implication that restricted availability might prevent the regular use. Overall, although usability and cost are seen as key, they are enhancing workplace accessibility might further facilitate effective adoption of wearable health technology.

Similarly, According to Western Governors University (2021), new medical technologies are essential for effective patient care as the population ages and the nursing shortage persists. These advancements not only improve processes for healthcare professionals but also enhance patient accessibility to care. This includes the automated IV pumps that allow for accurate control of medication dosages and nutritional support, this reduces the risk of human error and lets nurses focus on other responsibilities.

System integration

The findings indicate that the nurses largely have a favorable perceptions of integrating wearable health devices with the current hospital systems. They concur that the devices are a well-integrated with current hospital systems and electronic health records. Yet, they also find it somewhat difficult to integrate these devices into their workflow, suggesting the need for a further optimization in usability. There is also consensus that advancing system integration and growing organizational investment into integrating these devices with other technologies could make them more efficient. Overall, though the current integration is viewed positively, undertaking to solve workflow problems and investing in smooth system compatibility could make wearable health technologies most effective. A study supports the result indicate that, wearable health devices foster better communication and collaboration between patients and nurses by providing accessible and accurate health information, which empowers patients to take an active role in their care (Kim & Lee, 2024). However, successful adoption requires addressing

challenges such as nurses' technical proficiency, organizational support, and the reliability of the devices (Rahman & Wang, 2021).

Effective training in healthcare settings

The findings indicate that the nurses perceive training and education as important considerations for the successful implementation and utilization of the wearable health devices. Nurses are confident when they use wearable health devices following training and assert the need for a continuous education courses and frequent information on technological improvements. Nurses also concur with the efficacy of a peer-to-peer training and report willingness to participate in training programs concerning a wearable health devices. These results indicate that the nurses appreciate organized and ongoing learning experiences in order to enhance their competence and confidence in the proper utilization of the wearable health technologies.

A study linked with the data indicate that the integration of digital health technologies, such as wearable devices, mobile health apps, and telemedicine, is transforming nursing practice by allowing nurses to monitor and engage with patients in real time. These technologies enable nurses to track patient vitals, adherence to treatment regimens, and progress in recovery, leading to more personalized and responsive care (GCU Blog, 2024; ShiftMed, 2024).

Balancing Usability	Mean	SD	Verbal Interpretation
1. I find wearable health devices accessible in my workplace.	3.02	1.37	Neutral
2. believe improvements in device usability would encourage wider adoption.	3.94	0.82	Agree
3. I feel that wearable health devices are affordable for widespread implementation.	4.00	0.80	Agree
4. I believe that user-friendly designs would make wearable health devices easier to adopt.	4.10	0.80	Agree
5. I feel that addressing usability concerns would improve the effectiveness of wearable health devices.	4.02	0.78	Agree
Category Mean	3.82	0.91	Agree
System Integration	Mean	SD	Verbal Interpretation
1. Wearable health devices are well-integrated with the existing hospital systems I use.	4.05	0.79	Agree
2. I find it challenging to incorporate wearable health devices into my current workflow.	4.13	0.79	Agree
3. The integration of wearable health devices with electronic health records is seamless.	4.00	0.80	Agree

4. I feel that better system integration would increase the efficiency of wearable health devices.	3.95	0.80	Agree
5. I believe my organization invests in integrating wearable health devices with other technologies.	3.98	0.81	Agree
Category Mean	4.02	0.80	Agree
Effective Training in Healthcare Settings	Mean	SD	Verbal Interpretation
1. I feel confident using wearable health devices after training sessions.	4.02	0.82	Agree
2. I believe ongoing education programs would improve my competence in using wearable health devices.	3.98	0.80	Agree
3. My organization regularly updates me on advancements in wearable health technology.	4.06	0.84	Agree
4. I feel that peer-to-peer training is an effective way to learn about wearable health devices.	3.98	0.81	Agree
5. I am motivated to participate in training programs related to wearable health devices.	3.99	0.83	Agree
Category Mean	4.01	0.82	Agree

Legend: 1.00-1.80 – Strongly Disagree; 1.81-2.60 – Disagree; 2.61-3.40 – Neutral; 3.41-4.20 – Agree; 4.21-5.00 – Strongly Agree

Conclusion

The study indicates that the nurses view wearable health devices as useful tools for enhancing the patient care, but their implementation relies on more than the technology itself. Usability, effective system integration, and the access to continuous training all have a significant impact on how the comfortable and effective nurses feel utilizing these devices. Though there's a positive inclination to their usage even now, ensuring these the primary domains are tackled may assist in promoting the wearable health devices so they get adopted in a fullest capacities in medical environment.

Conflict of Interest

There is no conflict of interest between the authors in this manuscript.

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