Adopting the New Norms of Monitoring Postoperative Patients with Wearable Devices in Ireland - Advantages and Challenges

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ABSTRACT

There has been a growing interest in wearable devices to monitor postoperative patients, providing the healthcare professionals with real-time information on vital signs to detect potential complications and hence, take timely actions to prevent them. Several studies and pilot programme in Ireland and worldwide indicated the effectiveness of wearable devices in monitoring patients, which could result in better patient outcomes and more efficient healthcare system. As more healthcare providers adopt this new technology, better patient outcomes and a more efficient healthcare system can be anticipated.

Key Words: *Wearable devices, Continuous monitoring, Patient safety.*

How to cite this article: Lal S, Memon SA, Khan E. Adopting the New Norms of Monitoring Postoperative Patients with Wearable Devices in Ireland - Advantages and Challenges. *J Coll Physicians Surg Pak* 2024; **34(02)**:235-237.

Wearable monitoring devices have existed for several decades, with the earliest application by NASA in the 1960s to monitor astronauts' physiological responses during the space travel.[1] During the 1970s and 1980s, wearable monitoring devices were used in sports medicine to track athletes' vital signs during training and competitions.[2] In the early 2000s, commercially available wearable devices were introduced that gained popularity in the sports industry.[3] Since then, wearable technology has undergone significant advancements and has found numerous applications in the medical and healthcare sectors, including postoperative care.

The adoption of wearable monitoring devices for postoperative patients increasingly became prevalent globally, with many countries and healthcare systems implementing programme to integrate this technology. For instance, the pilot study conducted at the Hebrew University of Jerusalem in 2020 employed wearable monitoring devices to track the recovery of post-cardiac surgery patients.[4] Similarly, The West Middlesex University Hospital, UK, conducted a pilot study in 2019 that enabled patients who had undergone various surgery to use wearable monitoring devices to track their recovery progress which effectively identified potential complications and resulted in earlier hospital discharge for the patients in the same year.[5]

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Received: March 26, 2023; Revised: August 03, 2023; Accepted: October 11, 2023
DOI: https://doi.org/10.29271/jcpsp.2024.02.235

Wearable monitoring devices have also been a focus of pilot and other studies in the Irish healthcare sector. In 2019, the Irish government introduced a pilot project called Sláintecare to create a more integrated and accessible healthcare system. As part of this project, wearable devices were used to monitor patients with chronic conditions and support remote patient management. The pilot focussed on using wearables to track the vital signs and health parameters, helping healthcare professionals make better-informed decisions about patient care.[6] In a study conducted at the University of Limerick, wearable devices were used to monitor patients' physical activity levels with Chronic Obstructive Pulmonary Disease (COPD). The study aimed to assess the impact of physical activity on the quality of life and disease progression in COPD patients, highlighting the potential of wearable devices in supporting disease management and improving patient outcomes.[7]

Numerous devices exist for monitoring vital signs, offering real time insights to healthcare professionals. The BioHarness is a versatile, wearable physiological monitoring system that captures real-time vital signs and health-related data. Designed as an adjustable chest strap and being light in weight, it ensures comfort during various activities. The BioHarness has an integrated electrocardiogram (ECG) sensor for heart rate monitoring, a respiratory inductance plethysmography (RIP) sensor for tracking respiration, and a 3-axis accelerometer for monitoring body posture and physical activity. Bluetooth can wirelessly transmit data to compatible devices, enabling real-time or retrospective analysis. The device can also integrate with third party applications for advanced data analysis. Its durable and water-resistant design, and a rechargeable battery that allows up to 48 hours of continuous monitoring, depending on the usage the and settings, are some of its features.[8]

The Philips Biosensor is another discreet, wearable device that continuously monitors vital signs and physiological parameters. This wireless patch, developed by Philips, is suitable for various settings, including hospitals and home-care environments. It tracks heart rate, respiratory rate, skin temperature, body posture, and physical activity, providing real-time data for the healthcare professionals. The Biosensor wirelessly transmits data to compatible devices and integrates with existing healthcare systems, facilitating seamless data sharing and analysis. It also features proprietary software for data visualisation and analysis, and customisable alerts. The built-in battery is designed for single use, lasting several days without recharging or replacement.[9] VitalPatch, another sensitive wearable biosensor was developed by VitalConnect for continuous vital signs and physiological parameters in various settings, including hospitals and remote settings. This lightweight adhesive patch is designed for single-use and measures heart rate variability, respiratory rate, skin temperature, body posture, fall detection, and physical activity. Bluetooth wirelessly transmits data to compatible devices, enabling remote monitoring and real-time updates.[10] Other devices, such as Nymi and EarlySense, are also among the listed ones with similar functions.

However, adopting wearable monitoring devices in healthcare settings for postoperative patient care can significantly enhance patient outcomes. However, this new norm may present numerous challenges that must be carefully considered. One of the primary challenges of adopting wearable monitoring devices is the cost. These devices can be expensive, and purchasing them for an entire healthcare setting can be a significant investment. Healthcare settings may need to allocate additional resources to cover the cost of wearable devices, which could impact other areas of their budget. Proper budgeting and cost-benefit analysis can help healthcare settings weigh the pros and cons of investing in wearable monitoring devices.[11]

Secondly, Integrating wearable devices with existing electronic medical record (EMR) systems and other technology infrastructure can be challenging. It may require additional resources, including IT staff and support, to ensure that the devices are appropriately integrated and can be used effectively. This integration can be challenging, particularly in more extensive healthcare settings that rely on multiple technology platforms. However, proper integration can significantly enhance the effectiveness of wearable devices and streamline postoperative patient care.[12]

Another challenge to ponder on is training and education; healthcare professionals who need to become more familiar with wearable monitoring devices may require additional training and education to use them effectively. This can add to the workload of healthcare settings, which may need to allocate additional resources for training and support. Proper education and training of healthcare professionals can enhance their understanding and proficiency in using wearable monitoring devices. It can also increase patient satisfaction and improve overall healthcare outcomes.[13]

Additionally, wearable monitoring devices collect sensitive health data, which must be protected under privacy regulations. To protect the patient data, healthcare settings must ensure data security and privacy standards. This includes ensuring that data is stored securely and access is restricted only to authorised healthcare professionals.[14] Some patients may be reluctant to use wearable monitoring devices due to privacy concerns or discomfort with wearing the devices. Healthcare settings must address these concerns and educate patients about the benefits of using wearable devices for postoperative monitoring. Educating patients about the benefits of wearable monitoring devices can enhance patient compliance and satisfaction, leading to better outcomes.[15]

Another challenge related to wearable devices is their accuracy and reliability, which can vary depending on the brand and model. Healthcare settings must ensure that they choose reliable and accurate devices to provide the best possible care to their patients. This can be achieved by thoroughly researching and evaluating different wearable monitoring devices and choosing the ones that meet the required accuracy and reliability standards. Regular maintenance and calibration can also enhance the reliability and accuracy of these devices.[16]

Despite emerging as a promising technology to enhance postoperative care, they are also associated with potential complications. One significant complication is skin irritation or burns that can arise from prolonged use of adhesive patches or sensors, resulting in discomfort and potentially delaying healing.[17] Wearable devices can also interfere with surgical incisions or wound dressings, creating a risk of infection. Additionally, some patients may experience skin sensitivity or allergic reaction to the materials utilised in the devices. Malfunction of these devices is another possible complication, as they may lead to inaccurate readings or missed data, adversely affecting patient care. Furthermore, wearable devices may cause discomfort or anxiety, especially for patients unfamiliar with the technology or harbour concerns regarding device accuracy or privacy.[18]

In conclusion, wearable monitoring devices offer several benefits for post-operative patient care, including early identification of complications, reduced hospital readmissions, and improved patient satisfaction. However, healthcare settings must consider and address the challenges of adopting this new norm. Proper budgeting, integration, training, data privacy and security, patient acceptance, and device reliability can enhance wearable monitoring devices' effectiveness and improve healthcare outcomes.

COMPETING INTEREST:
The authors declared no conflict of interest.

AUTHORS' CONTRIBUTION:
SL, SM: Initial write-up.
EK: Final write-up.
All authors approved the final manuscript for publication.

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