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EDITORIAL COMMENTARY

Wearables – A Revolution in Neonatal Monitoring?

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Wireless monitoring equipment is a wearable device that monitors the vital signs of the neonate and transmits real-time data from the infant's body to a central monitoring station. The wearable device offers many advantages over traditional monitoring systems, including increased mobility for the neonate and the provider, the ability to monitor remotely in areas with limited access to healthcare and continuous monitoring. These devices offer improved comfort for the newborn and their parents as they are small, wearable and non-invasive allowing unrestricted parental care in a more natural and stress-free environment.

Numerous studies have focused on evaluating the accuracy, reliability, and efficacy of wireless monitoring devices in neonates [1]. In this issue of IJP, Aggarwal et al. evaluated the efficacy and safety of a novel wireless monitor, the Nemocare Raksha (NR), an internet of things (IoT)–enabled smart wearable device to continuously monitor four vital signs (heart rate, respiration rate, body temperature and oxygen saturation) for 6 h in neonates admitted to the pediatric ward [2]. The device weighs just 20 g and could be applied to the neonate's foot. The data from the device is transmitted wirelessly to an Android tablet and cloud server for seamless remote access to the health providers. The NR device had good safety with no discomfort, skin changes or local rise in temperature. The device showed a good level of agreement for heart rate and oxygen saturation among the four parameters measured. Since this was the first study to evaluate the safety and efficacy of NR, the device was used in stable neonates for a shorter period of time and at hospital settings. The scalability of this device depends on further testing in sick neonates and at community settings.

ANNE monitoring system is another wireless vital sign monitoring system that uses small, light sensors attached to the neonate's skin [3]. The device was tested in preterm and term neonates and demonstrated safety and efficacy in vital signs when compared to standard monitoring. Another innovation is a smart chest belt made of textile called "NeoWear" to monitor respiratory rate and detect apnea [4]. The BEMPU bracelet is a smart wearable device used to detect hypothermia in neonates. Tanigasalam et al. showed that BEMPU could monitor body temperature continuously and had an accuracy of 95.8% in detecting hypothermia [5]. Many other wireless monitors built into socks, onesies, buttons, leg bands, and diaper clips have been developed to monitor neonatal vital signs. Most devices have undergone only preliminary testing in controlled hospital settings and limitations in their accuracy have been noted [6].

Despite benefits, the limitations of wireless devices need to be considered especially when used in remote settings. Wireless devices are susceptible to interference from other electronic devices and sources of electromagnetic fields, which can affect accuracy of data transmission. The distance between the device and central station may lead to connectivity issues or signal loss, resulting in incomplete or delayed data transmission. Wireless devices rely on batteries for power which may need frequent recharging or replacement. Factors such as sensor placement, device calibration and motion artefacts affect signal quality and accuracy of measurements. Hence regular device maintenance, calibration, and quality assurance protocols are necessary. The wireless transmission of sensitive medical data raises concerns about data security and privacy. Robust encryption and authentication mechanisms are mandatory to protect data from unauthorized access or interception. Continuous monitoring over prolonged periods can generate enormous data that becomes difficult to interpret without algorithms to automatically process and interpret data. Finally, the adoption of wireless neonatal monitoring devices may involve significant costs, including the device cost, installation of central monitoring station, data transmission and training of healthcare staff.

In recent years many smart phone integrated wearables have been marketed to parents for use in the home for well infants. There are no medical indications for electronic

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monitoring of healthy infants at home and the application of inaccurate devices or for inappropriate indications or improper interpretation of data can lead to potentially devastating consequences [6]. Future research should address the limitations and continuously improve the technology to enhance the safety and effectiveness of wireless neonatal monitoring devices.

Declarations

Conflict of Interest None.

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