REVIEW ARTICLE

Smart Devices for Pregnant Women in Healthcare – A Comprehensive Review

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ABSTRACT

Everyone has heard the irony about rural health care in nations with poor or medium incomes because it is so far away and the roads are so bad people can't get there, but everyone has cell phones, which allow instant communication over hundreds of miles. Over 5 billion people were wireless customers as of 2010. According to a survey by the International Telecommunication Union (ITU), 80% of people living in rural areas and over 90% of people on the planet had access to mobile networks. To control and improve the prenatal care that women receive, and their entire state of health. Out of the 100 pregnant women who used the smartphone mobile terminal app, they delivered a baby. These one hundred were the "experimental group" in the sense that they worked at the hospital and were part of the health assistant app testing process. The control group consisted of hospitalized pregnant women who did not take part in the app's management.

Keywords: Smart devices, Healthcare, Remote area.

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INTRODUCTION

The internet of things, IoT for short, is a relatively new technology that is growing by leaps and bounds and could one day completely change the way we relate to the world around us. More than 75 billion devices will be connected by 2025, according to projections. The World Health Organization states that timely information intake and preventative treatment are the two most important factors in maintaining an individual's health. People's needs for health care and medication are increasing along with the economy and technological advancements.[1] Many people's access to health care is currently hampered by the drawbacks of the previous medical model, such as "can't get in to see a doctor," "three months and one week," and other medical issues, but these are beginning to crop up more frequently. China's health and medical system views the need to overhaul the medical model as critical at this time and proposes medical informatics as a solution. Additionally, by using computer technology, it ensures that most individuals have access to easily accessible medical treatments, complete medical data on file, and high quality medical and health services. It also increases the system's knowledge base.

The smartphone has become the most widely used "personal computer" of today, and it has fundamentally altered human communication. Smartphones also have vibrant display content, a touchscreen interface, a bigger CPU and memory capacity, high-speed data transfer, and network connectivity features, all due to the rapid advancement of hardware. It is because of these advantages that cell phones are being looked at as very promising medical instruments. Additionally, the public is progressively coming to understand a new paradigm for health services thanks to the mobile health care model, which naturally combines mobile internet with smart terminal devices.[2] Maternity and child care services, which are a big part of the public health services are visited mainly by young parents (which would be smartphone users). As a result, the expansion of mobile health care for mothers and children tends to progress slowly.[3] Pregnant women especially is interested in health education and advice on maternity and pediatric care. If need be, this includes getting immediate access to remote medical advice and diagnoses, vitals taken and tracked at all times to see exactly how their health is at any given moment and asking questions about maternal and child health. Pregnancy is clearly important. While doing that, it is also important to construct and develop a mHealth system that has the possibility to improve maternal healthcare services by utilizing real-time communication, the great mobility, and the unlimited software capabilities that cell phones offer.[4]

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Advantages of Smart Devices for Pregnant Women

Health monitoring

- Continuous remote monitoring for slight changes throughout pregnancy which would lead to early diagnosis of medical complications.
- Smart fetal heart rate monitoring (SFHRM) devices, which can provide complete fetal heartbeat information, can avoid intrauterine distress and hypoxia.
- Pregnant women can now monitor not only their own health but their fetus's health as well with the use of "smart wearable electrocardiogram" (ECG) equipment.

Empowerment and control

- Give pregnant women a feeling of control and power over their medical care so that they will be more likely to participate in it.
- Less anxiety and stress since women can now monitor their own health, and that of their babies, as they occur.

Improved health outcomes

- Allow for early diagnosis and treatment of medical problems which will result in better medical conditions for not only the mother but for the child as well.
- Lower medical expenses and raise health benefits.

IoT Technologies in Healthcare

Sensors

An integral part of IoT devices are sensors. They can read temperature, blood pressure, pulse, glucose levels, etc. From medical devices to wearable computers, to the actual human body itself, these sensors can be embedded. Table 1 demonstrates the kinds of sensors used in medical.

Effectiveness of health interventions

Variable effectiveness outcomes resulted, given that several mHealth therapies targeted distinct conditions during the prenatal and postnatal stages. Nevertheless, although differing in their degrees of efficacy, every study showed that mHealth interventions do, in fact, improve maternal health care. Every study on depression showed a consistent agreement, indicating the degree to which mHealth therapies assist in alleviating the condition. Every review that has been done on depression has shown that mHealth therapies can help reduce depression during pregnancy and labor.[5] Only 18% of the pregnant and postpartum women had a clinical diagnosis of depression at the 12-week evaluation, compared to 79% in the control group, according to one of the five trials that had positive outcomes.[6,7]

All three of the research that looked at mHealth interventions and how they affect maternal healthcare utilization agreed on the same thing. These included improved antenatal care, the use of a trained attendant during delivery, which decreased perinatal mortality, or a combination of ANC and giving birth in a medical facility. However, on the other hand, the mHealth interventions that targeted alcohol or drinking and smoking were also effective, although in different ways. Another two major setbacks were the areas of obesity/overweight, especially when pregnant, and then how managing diabetes during pregnancy affects the baby. For instance, 2/3 of the research indicated a positive influence on gestational weight gain.[8,9]

Indoor healthcare environment

IoT devices can be used for equipment management, inventory tracking, and patient monitoring in indoor medical environments, such as hospitals. IoT sensors can monitor temperature, humidity, and air quality in addition to helping to prevent the spread of disease. IoT provides useful features for patient and staff location tracking in indoor healthcare contexts. Real-time tracking of people's movements can be achieved by using wearable technology, RFID tags, or smartphone-based systems. This technology improves emergency response times, streamlines workflow, and makes navigation easier, all of which contribute to better patient care. Using smartphone-based systems, it becomes feasible to track people's movements in real-time. This technology improves emergency response times, streamlines workflow, and makes navigation easier, all of which contribute to better patient care.[10]

Indoor location technology also makes it possible to track and manage medical assets and equipment. Healthcare practitioners may effectively monitor the location, usage, and maintenance requirements of medical devices by adding RFID tags or using sensor networks. This minimizes the costs related to equipment loss or misplacement and guarantees that the things are available when needed. This paper proposes a non-intrusive indoor location framework for internet of things healthcare based on wireless sensor networks. It uses blockchain-based smart contracts to enable role-based access control for system security.[11]

There are now IoT devices like wearable sensors and smart beds that can monitor patients' vital activity levels and track them over time to report any changes to the medical staff. This

Table 1: Types of standard sensor

Sensor type	*Measurement*	*Clinical application(s)*
Electrocardiogram	cardiac electrical activity	Detecting arrhythmias, heart disease
Pulse oximeter	Heart rate and oxygen saturation levels	Asthma, COPD, and surgical oxygenation monitoring
Blood pressure	Blood pressure	Monitoring hypertension and hypotension
Glucose	Blood or interstitial fluid glucose levels	Tracking diabetes
Temperature	Body temperature	Identifying hypothermia or fevers
Respiratory	Respiratory rate and rhythm	Keeping an eye on respiratory conditions like sleep apnea

could not only improve patient outcomes but also decrease the chance of harmful events occurring.

Outdoor healthcare environment

Personalized localization, remote patient monitoring and enhancing people's quality of life in outdoor healthcare environments requires the integration of intelligent and IoT technologies.

The public's varied healthcare needs are effectively met by the design of these smart facilities. The use of IoT-enabled kiosks is one noteworthy feature of smart outdoor healthcare environments. Providing up-to-date information about local pharmacies, emergency contact numbers, and healthcare professionals, these interactive kiosks work as information centers. In an emergency, people can find the closest medical facilities, obtain tailored health information, and get emergency aid right away.[12]

Moreover, it is expected that in the future, fitness stations with internet of things connected exercise equipment may be installed in smart parks and recreational spaces. These imagined smart fitness stations may collect important health parameters, offer individualized workout recommendations, and monitor users' behavior. It is envisaged that customers would be able to access these much-anticipated facilities via smartphone apps, which could enable customized workout experiences based on personal preferences and health goals.[13,14]

Mobile technology in health care

There are tons of public-private partnerships that have blossomed around mHealth for the purpose of encouraging the expansion of mobile technology use in the medical field.

In the absence, mHealth is defined as "medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants (PDAs), and other wireless devices" by the World Health Organization (WHO). The four primary areas of mHealth application currently being used in low-resource countries to enhance well-being are: (a) worker communication and training; (b) improved availability of information and education about healthcare; (c) enhanced monitoring for better disease tracking and diagnosis; and (d) simpler access to public health information. Furthermore, mobile technology can be utilized to enhance provider-to-provider communication. After reviewing the difficulties in managing postpartum hemorrhage in nations with limited resources, cell phones are taken into consideration as a way to enhance community and healthcare worker communication.[15-18]

CONCLUSION

The application of smart devices for pregnant women in healthcare emphasizes the potential of mobile technology, IoT devices, and mhealth interventions to improve services for maternity and pediatric healthcare. It highlights the effectiveness of mobile interventions in enhancing maternal health care, reducing perinatal mortality, and addressing conditions like depression, alcohol use, smoking, obesity, and diabetes management during pregnancy. These will also overview the importance of mobile health services in rural areas and low-resource settings to bridge the gap in healthcare accessibility.

Furthermore, the role of IoT devices in indoor healthcare environments for tracking inventory, managing medical equipment, monitoring patients, and improving patient care. It touches upon the significance of mobile technology partnerships in expanding healthcare access, enhancing disease tracking and diagnosis, and improving provider-to-provider communication. Overall, this article underscores the transformative potential of mobile technology and IoT devices in revolutionizing services for maternity and pediatric health care worldwide.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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