Wireless Healthcare Opportunities and Challenges

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Healthcare costs are representing an increasing percentage of gross domestic product (GDP) for many countries, and it's growing. According to the World Health Organization (WHO), Figure 1 shows the total healthcare expenditure (THE) of six developed countries, which includes the United States where almost 17 percent of the GDP in 2009 was for healthcare. Furthermore, the percentage of GDP for healthcare in other countries such as Canada, France and Germany are on the rise [1].

This rising trend has created an urgent need for many countries to put in place an innovative and cost-effective method for delivering healthcare. With several technological advances achieved in recent years within the wireless industry, healthcare providers are more inclined to integrate wireless healthcare as part of the global healthcare system. Wireless healthcare can help improve our healthcare system in several ways, such as remote monitoring of patients more efficiently, better cooperation between different entities with real-time information sharing, and more portable clinical equipments.

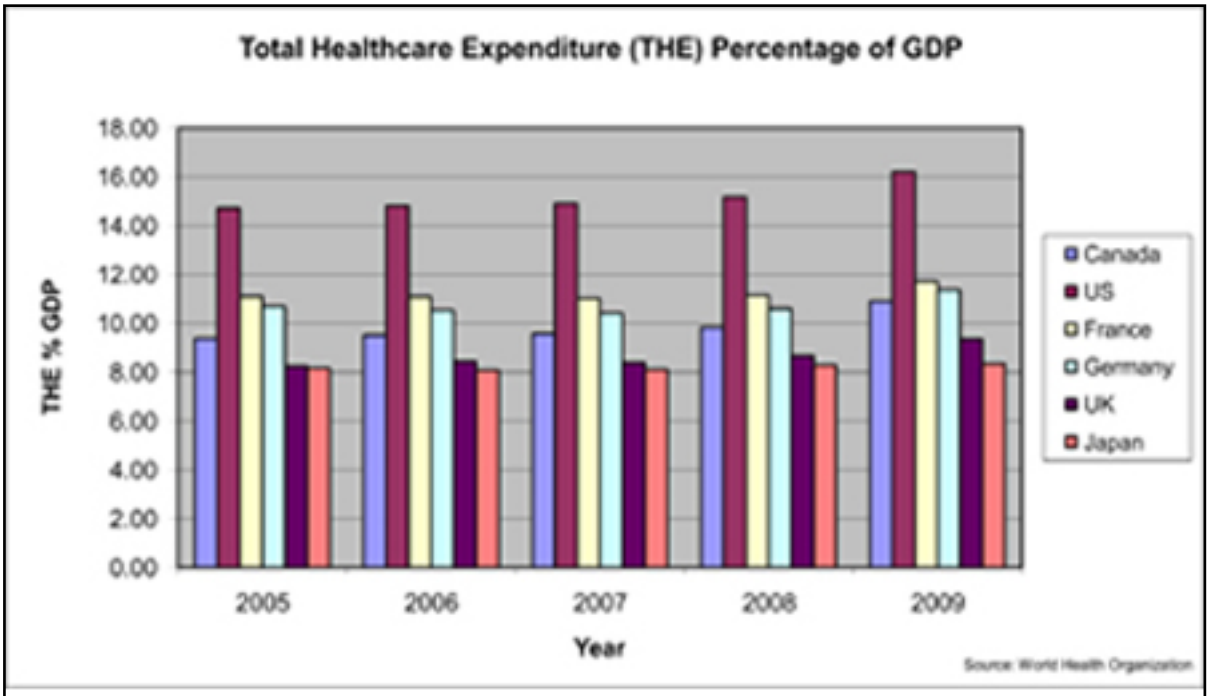

Figure 1. Total Healthcare Expenditure (THE) percentage of Nations' GDP.

While presenting great opportunities for healthcare systems, wireless healthcare still faces several challenges before there can be full adoption. In this article, we discuss in detail wireless healthcare, the opportunities it offers, as well as challenges.

Wireless Healthcare Opportunities

Imagine a Seattle-based doctor using his tablet to follow a surgery taking place in Miami. Or envision a cardiologist located in Dallas monitoring the occurrence of heart events for his patient who is vacationing in Colorado. These examples provide a good snapshot of how wireless healthcare is profoundly changing the way healthcare professionals carry out their work. Both healthcare providers and patients are now looking at healthcare through a different paradigm. Wireless healthcare represents an opportunity to improve the healthcare system at different levels:

Reduce length of hospital stay. Make information-sharing easier with electronic access to labs and other test results to help speed diagnostic and decision-making.
Bridge hospitals and home. Remotely monitor a patient after release from hospital to help ensure the patient's recovery is well on track.
Reduce clinical errors. More accurate equipment reduces the patient's need to endure multiple tests at different sites.

Why is Wireless Healthcare a Success?

The emergence of wireless healthcare has been fostered by technological advancements in two critical domains: collection and processing, and transmission (Figure 2).

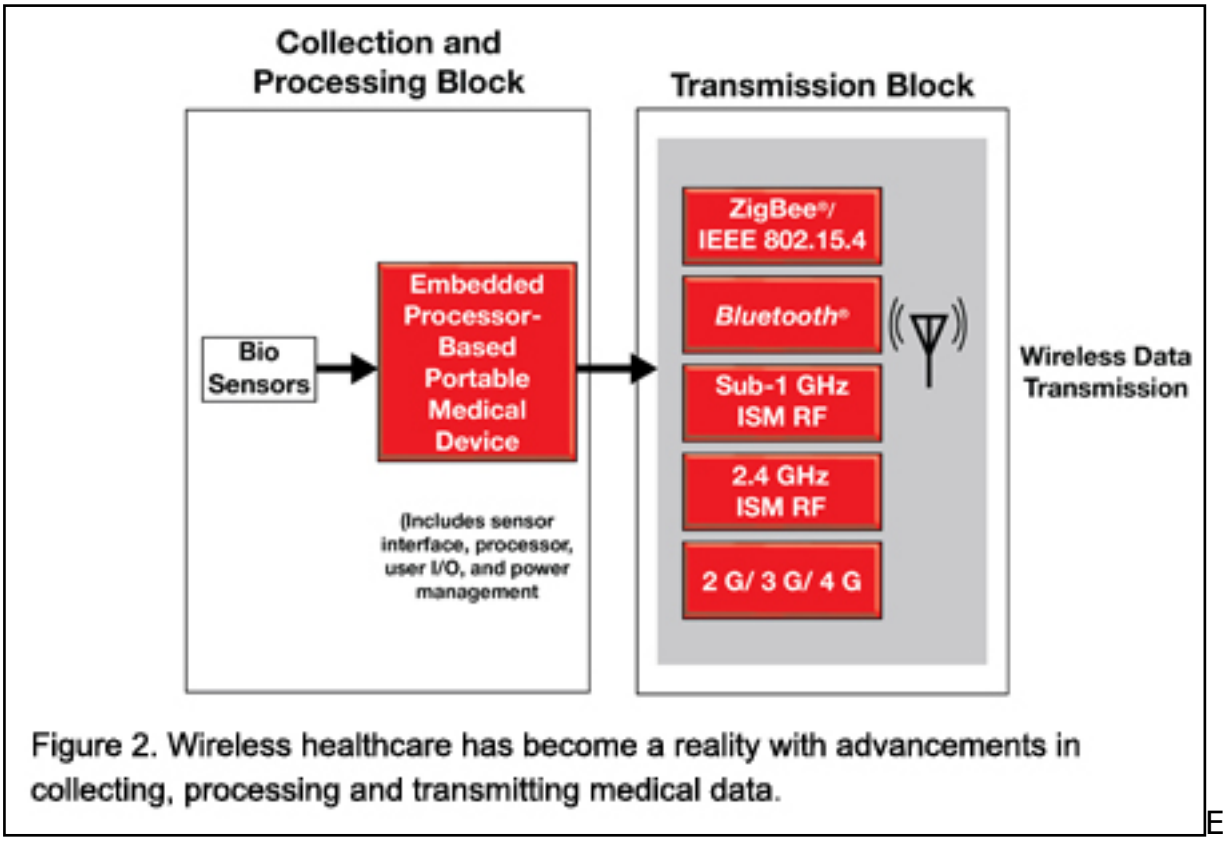

Figure 2. Wireless healthcare has become a reality with advancements in collecting, processing and transmitting medical data.

Electronic Component Engineering

Recent innovations have been achieved in several key electronic collection and processing blocks. Devices such as bio sensors, processors and battery management have improved extensively in both their performance and form factors. These innovations allow medical devices and equipments to be designed to

perform in several ways. For example, it is very common today to see behavioral and characteristic sensors able to collect and process relevant information in an accurate, intelligent, and low-cost fashion, with extended battery life. These types of sensors have contributed significantly, making remote patient monitoring more efficient than ever before.

Wireless Standards

Wireless technologies, or the transmission blocks, are the cornerstone of wireless healthcare. Healthcare providers are taking great advantage of the explosion of wireless technologies that have allowed the emergence of several wireless standards, especially in the Industrial Scientific & Medical (ISM) band. The ISM band frequency spectrums can be used by anyone without a license. The only requirement is that the product developed and in use must comply with the rules that govern this part of the frequency spectrum. New standards such as ZigBee/IEEE802.15.4, Bluetooth, BLE, and ANT are widely used in the medical domain along with several other proprietary technologies operating in the sub-1 GHz or the 2.4 GHz spectrum.

Note that these standards, while already being used in the medical arena, have not been optimized for medical applications. The bottleneck resides mainly on the current consumption as most of them present high-peak current. As shown on Figure 3, there are other wireless standards being used in wireless healthcare, such as 2G and 3G. Unlike the standards specific to ISM bands which target short distance transmission, these standards are used in cellular phone networks, which represent much longer distances. While short distance standards allow the transmission of information from the point of collection to a terminal, the 2G or 3G standards help convey the information to remote location where the data can be analyzed and stored. The use of 2G/3G networks has allowed many developing countries to bring healthcare to remote cities.

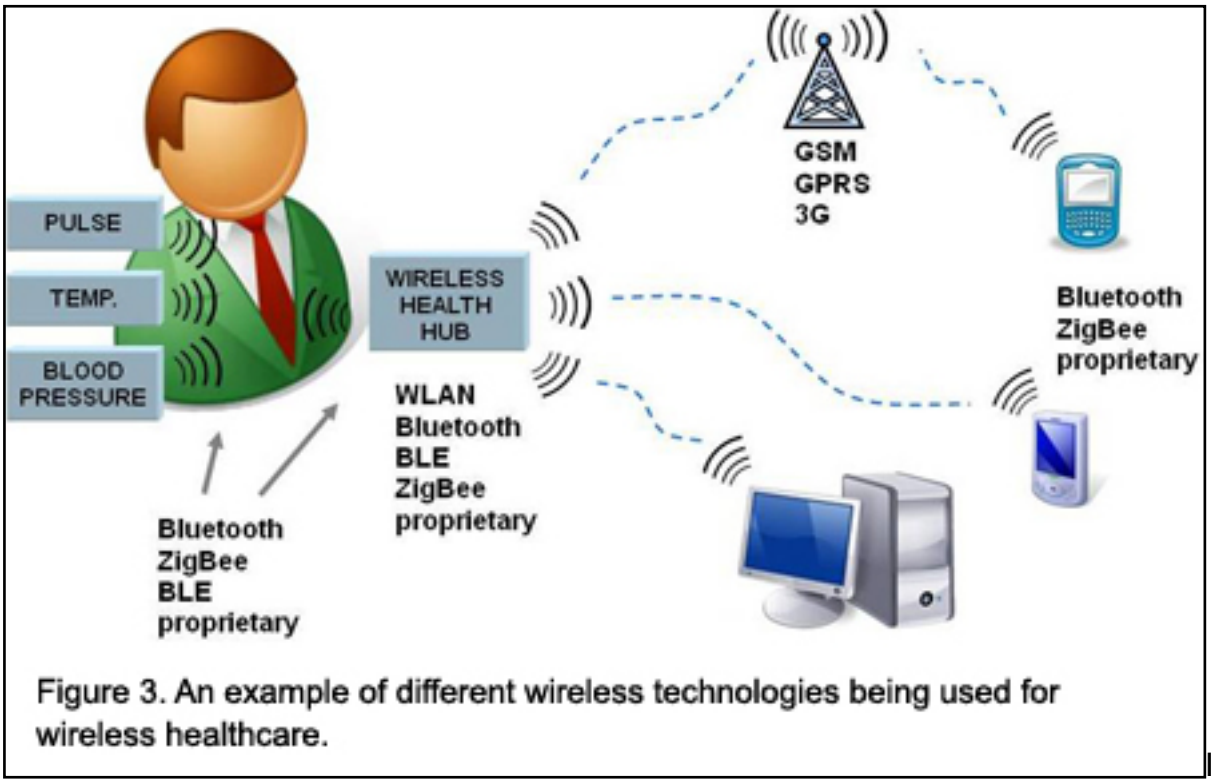

Figure 3. An example of different wireless technologies being used for wireless healthcare.

In addition to the progress made on electronic component engineering and the proliferation of wireless standards, several other factors such as more investments in IT technology by healthcare entities have contributed to the development of wireless healthcare. These investments allow the deployment of website portals to aggregate patient information, clinical applications, and back-office systems. They also help streamline workflow processes as well as simplify the use of many applications such as admission, access to patient records, and claim submissions.

Key Considerations for Wireless Healthcare

While the emergence of wireless healthcare has introduced several opportunities to help change the way healthcare has been viewed up to now, other key considerations need to be taken into account for the technology to become truly wide-spread.

Physical connectivity. Connectivity can be a huge challenge, especially if the location of operation is situated in regions that do not allow proper propagation of signals (basement areas, steel-encased building with glazed windows, and other disruptive structures,). This lack of connectivity coverage can impede any wireless system from functioning properly.

Data security. Security is one of the most critical issues in wireless healthcare. It is very important that patient data and other related information be transmitted and protected against any type of corruption or intrusion. Different security requirements must be considered when developing a wireless healthcare system. These include access security in all the hardware devices in the system, security in data transmission, and data storage security – especially in the hospital server.

Interoperability. Interoperability among equipment using different wireless technologies is a bottleneck for wireless healthcare. The ability to implement

interoperable wireless equipments will further help to enable the full adoption of wireless healthcare.

Several organizations such as Continua Health Alliance have been very active in taking the lead to resolve this critical issue. Continua is dedicated to establishing a system of interoperable personal connected healthcare solutions that will enable interoperability between different wireless healthcare devices

Conclusion

In the past, pessimism dominated perception towards wireless healthcare. However, today, that perception has changed dramatically as healthcare providers and decision makers are realizing the many benefits that can be obtained through wireless healthcare. The road to a full scale deployment may still have a few bumps, but it is fair to say that the worst is nearly behind us.

References

Telehealth statistics: World Health Organization (WHO), National Health Expenditure Report 2009,

For more information on these and other telehealth solutions, visit: www.ti.com/telehealth-ca [1].

For more information about consumer medical applications, visit: www.ti.com/consumermedical [2]

About the Author

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