# Technologies of Artificial Intelligence and Smart Microelectronics in Mobile Telemedicine

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## Abstract

*The integrated digitalization of medicine, the use of the Internet of Intelligent Things, and the networks of medical wireless sensors offers ample opportunities to remotely support the appropriate quality of life of chronically ill patients, the elderly, and athletes and professionals with heavy physical or mental workloads.*

Based on this, at the present stage of development of artificial intelligence technologies and smart wearable microelectronics, the following basic directions of digital mobile telemedicine development can be identified:

1) Development and creation of wearable medical monitors, which are built on the basis of smart sensors for real-time measurement of basic medical parameters and integrated into a wireless sensor network.

2) Development and creation of wearable means for reading and primary processing of measured medical parameters, combined with smart sensors.

3) Development and creation of wearable means for transmitting parameters, which are measured by a mobile medical monitor and which characterize in real time the human condition, to remote decision-making centers.

4) Development and creation of remotely controlled wearable injectors for the introduction of the necessary drugs that support human life.

The application of wireless sensor networks and wireless devices in medicine makes it possible to improve the quality and efficiency of medical services through the ability of doctors or cognitive centers to remotely monitor the patients and obtain valid information about the patient's condition, usually in real time to conduct the diagnostics and make the preliminary diagnosis. In some cases, during such remote medical monitoring, the patient can be at home or in more comfortable conditions, which has a positive effect on the psychological state of the patient and contributes to the positive dynamics of treatment.

In the general case, the patient's remote medical monitor consists of a number of wearable (body) sensors, a remotely controlled wearable injector (or injectors) and a data wireless transmitter.

The wearable sensors are connected to the data wireless transmitter via wires or, more often, via a short-range wireless protocol, such as Bluetooth. Often a smart phone or tablet can be used as a data wireless transmitter.

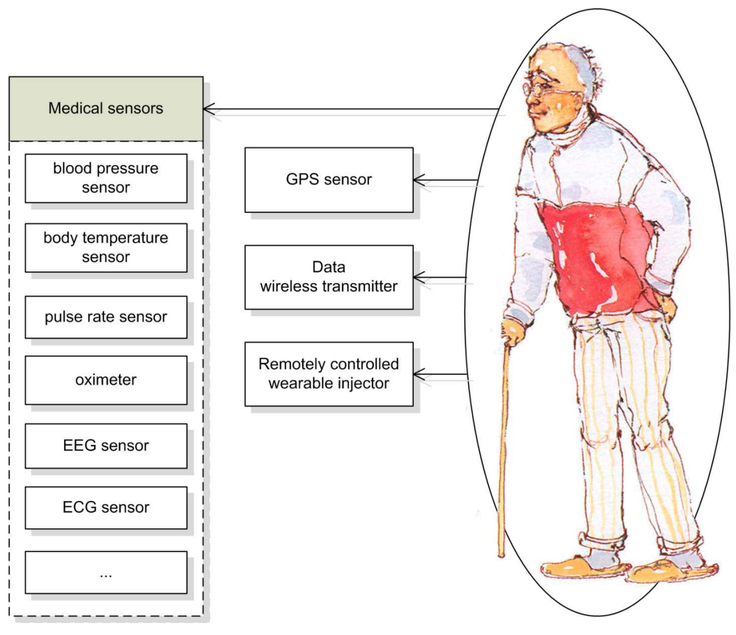


Fig . 1. Remote medical monitor of patient

In addition to transmitting data from wearable sensors to a remote server of a medical institution, the wireless data exchange module is used for remote control of wearable injectors to introduce the necessary drugs to the patient.

It should be noted that remote medical monitoring is not only creating the wireless channels of medical data transmission, but mainly organizing and maintaining the necessary infrastructure for the operation of such monitoring systems. This means the organization of Internet services, storage and protection of data on a remote server, the creation of application software, the integration of wireless medical sensors, devices and actuators at the patient level, long-term operation of wireless sensors and devices in "field" conditions without maintenance, data processing, including "big data" processing by the cognitive diagnostic center.

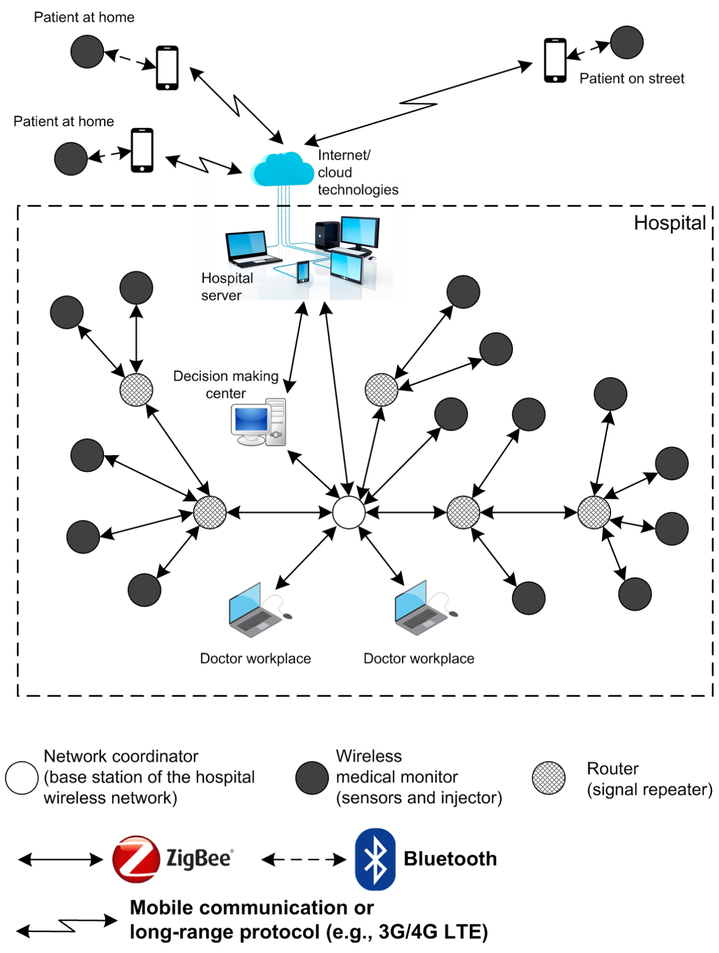


Fig . 2. An example of a remote medical monitoring system

This approach to the creation of a remote medical monitoring system ensures the acquisition, receiving or transmission of data in real time.

It follows from the above that remote medical monitoring systems with elements of artificial intelligence, such as wireless measuring smart sensors, smart injectors programmed to introduce drugs in proper time or in crisis situations, as well as remote medical monitors in general, today become the subject of engineering development and practical application, which can not be said about remote cognitive centers of diagnostics and diagnosis making.

## Conclusion

*The implementation of individual remote means of maintaining quality of life includes the creation of new and the use of existing miniature or microelectronic medical sensors that directly read medical parameters from the patient's body. Such sensors are designed to monitor heart rate, respiration and blood pressure, read heart signals, determine skin moisture, record a fall or abrupt changes in the patient's position and other body parameters in real time. Such sensors have to include the miniature interfaces for data acquisition, analog-to-digital conversion and data preprocessing of medical parameters received from medical sensors located on the patient's body. Also it is necessary to create new or apply existing miniature data communication means to remote medical centers according to modern communication standards, automated and remote diagnostic tools with elements of artificial intelligence, remote-controlled injectors to introduce the medicines in case of critical condition of the patient. The current state and prospects for the development of these tools are discussed in the publication.*