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A wireless oxygen saturation and heart rate monitoring and alarming system based on the Qatar Early Warning Scoring system

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ABSTRACT

Background: Peripheral oxygen saturation (SpO₂) and heart rate (HR) are important indicators for various medical conditions such as cardiopulmonary disorders and respiratory diseases. The main objectives of this study is to design and implement a portable embedded medical system. This system wirelessly obtains SpO₂ and HR data from a patient as well as his/her coordination, and sends a short messaging service (SMS) alarm to the emergency control room to contact the patient and confirm his/her health status or dispatch an ambulance in case of his/her measurements are outside the normal range based on the Qatar Early Warning Scoring (QEWS) system.

Methods: The system mainly consists of a Bluetooth finger pulse oximeter, a Bluetooth-enabled microcontroller, a global positioning system (GPS) and a General Packet Radio Service (GPRS) module. It is divided into three main stages. In the first stage, the readings of SpO₂ and HR are obtained from the patient in real time. During the second stage, the readings obtained are sent over Bluetooth to the signal acquisition and processing unit. The received data is processed and a decision is made whether a SMS alarm should be sent or not. The final stage is concerned with sending the alarming SMS to the emergency control room over the GPRS network based on the QEWS system.

Results: The system was implemented and successfully tested as a stand-alone unit by avoiding the use of a PC or a smartphone for data processing. The transmitted SMS alarm includes the SpO₂ and HR readings, the QEWS score and the GPS coordinates.

Conclusions: The designed system is wireless, portable, and user-friendly. This system possibly promotes quality of care for the patient living outside hospital and could improve response time from an ambulance service point of view by determining the exact location of the patient.

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