A ventilator monitoring system based on mobile devices

H-K. WU, C-K. LO, J-M. CHEN. ***A ventilator monitoring system based on mobile devices.*** *Gerontechnology 2014;13(2):308;* doi:10.4017/gt.2014.13.02.363.00 **Purpose** As a result of a natural decline in physical functions, the elderly tend to develop a variety of acute or chronic diseases. Their use of ventilators during the occurrence these acute or chronic diseases or surgery can easily allow them to receive Prolonged Mechanical Ventilation (PMV)[1, 2]. This paper presents the development of a mobile device-based Ventilator Monitoring System (VMS) that facilitates the use of medical resources and improves the quality of healthcare, thereby easing the burden on families and medical institutions. Considering the large amount of breathing data sent by the ventilator, we also propose a Dynamic Data Rate Adjusting Algorithm (DDRAA) that reduces the amount of data transmitted across networks. **Method** The architecture of the proposed VMS is depicted in *Figure 1*. It comprises a Mobile Home Ventilator Gateway (MHVG), a Mobile Ventilator Monitoring Station (MVMS), and a Ventilator Management Platform (VMP). The MHVG and MVMS are installed in mobile devices, such as smartphones and tablet computers, and communicate with the VMP via mobile networks. The MHVG is connected to the ventilator via Bluetooth, and collects and sends the breathing data, physiological information, and alerts to the VMP. Prior to sending the data to the VMP, the MHVG uses the DDRAA to reduce the amount of data, a feat achieved by analyzing the breathing frequency of patients and then adjusting the time interval of the data point based on the breathing frequency. The VMP interprets and stores the received data, which allows the medical staff to remotely monitor the working condition and alarm status of the ventilator from the MVMS. *Figure 2* shows a sample of the breathing data received in the MHVG. Furthermore, to enhance the related knowledge of family members, the MHVG provides them with health education videos, question and answer sessions, and other functions. **Results & Discussion** The high mobility of MHVG and MVMS facilitates improvements in the quality of telecare and reduces the time taken to respond to alarm-related events. The health education videos can help to improve the patient and his/her family members' awareness of the associated disease. Furthermore, the MHVG can connect to a maximum of eight ventilators, thereby making the VMS suitable for healthcare centers. The DDRAA can also reduce the amount of data transmitted over networks. In our simulations, for breathing frequencies of 15–20 breathe/minute, our algorithm was able to reduce the amount of breathing data transmitted by approximately 34.17%. Finally, the proposed system can increase mobility and consequently, the mental burden on patients, their families, and medical staff.

References

1. Carson S. Current Opinion in Critical Care 2006;12(5):405-11
2. MacIntyre NR, Epstein SK, Carson S. Chest 2006;128(6):3937-54. doi:10.1378/chest.128.6.3937

Keywords: health & self-esteem, ventilator monitoring, mobile devices

Address: Department of INSA, Ling-Tung University, Taichung, Taiwan;
E: huaikuei@gmail.com

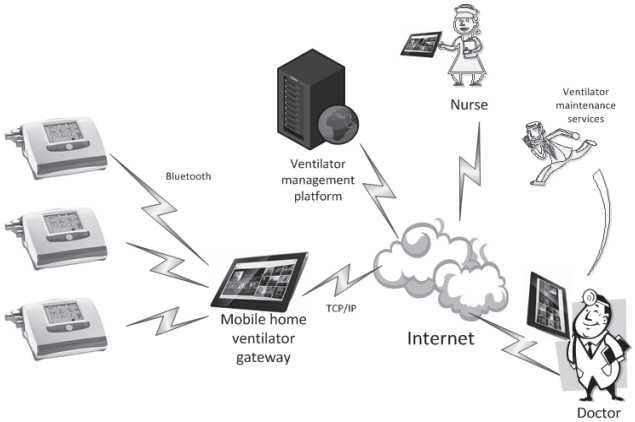

Figure 1. The proposed system architecture

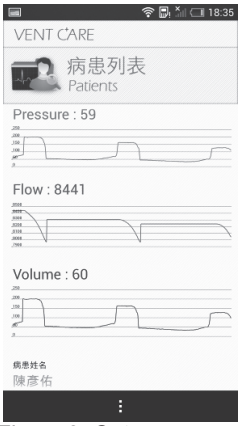

Figure 2. Gateway screenshot