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An Evaluation of the implementation of RFID Wireless Body Temperature Monitoring System to enhance Patient Experience and Work Efficiency.

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Objective: To report on an evaluation of a high technology solution to enhance patient experience and occupational health in an isolation ward with the RFID body temperature monitoring system.

Background: Traditionally, caregivers have to approach the patients at their bedside and monitor their body temperatures by using a handheld thermometer. Patient comfort might be compromised with the regular disturbance of temperature taking. On the other hand, staff working in isolation wards may pose risk of infection for performing body temperature monitoring frequently to these patients. In these regards, an advanced body temperature monitoring system has been introduced to an isolation ward in Tuen Mun Hospital of Hong Kong since August 2010.

Methods: This system applies the Radio-frequency Identification (RFID) technology to receive signal of body temperature with a sensor (maximum transmission power: 6 dBm) that is attached by a waterproof adhesive film to the abdomen of the patient through active RFID signal transmission to a wall mounted receiver (Maximum transmission power: 10 dBm). The signal is then automatically transferred to a digital temperature chart in the computer monitor to be displayed in the nurse's station, real-time "High-Low" temperature alarm and frequency of charting can be set for different patients. After the installation, an evaluation of the following parameters was studied:

a) The temperatures measured by the RFID system and the traditional direct contact ear thermometer were statistically compared using t-test and F-test. The difference of the right-left ear temperatures served as the control group. The sample size of each measuring method was over 300;

b. All the medical devices near the RFID system, including the receiver and the temperature sensors being attached to the patients, were closely monitored. Any influence on the medical devices due to electromagnetic interference (EMI) caused by the RFID system was recorded; and

c. The amount of time saved per temperature taking.

Results: a) The difference in temperatures measured by the RFID system and the ear thermometer were compared. There is no significant difference ($P<0.05$) between the mean and standard derivation (SD), according to t-test and F-test respectively, between the 2 experimental groups and control group, suggesting the RFID system is comparable to the traditional ear thermometer in terms of accuracy.

b) There are some published journal articles [1]. In order to address this potential risk, the condition of medical devices near the RFID system was closely monitored. There is no reported EMI of critical care medical devices caused by RFID since the installation of the system. The result echoes to a similar study performed in the laboratory setting [2].

c) At least 3 minutes could be saved per temperature taking due to the elimination of manual charting and hand washing before and after entering the isolation rooms. For a typical day in the isolation ward, it is common to have 10 patients requiring temperature taking 6 times per day, hence, 180 minutes of nursing time could be saved a day.

Conclusion

RFID technology can effectively enhance patient experience as well as minimising the risk of infection by nursing staff due to the elimination of unnecessary contact with infectious patient. Patient safety could also be enhanced as high fever alert can be made with real-time frequent recording of the body temperature in the computer system whilst waste of paper and record process can also be eliminated. Application of such system is recommended in other isolation ward settings.

Reference

[1] Electromagnetic Interference from Radio Frequency Identification Inducing Potentially Hazardous Incidents in Critical Care Medical Equipment. JAMA, June 25, 200 - Vol 299, No. 24, pp 2884-2890

[2] Hospital Efficiency Improvements through Implementation of RFID Systems - Safety Concerns from Biomedical Engineers. Hong Kong Biomedical Engineering International Conference 2008.