RFID Approach to Track Clinician Activity in The Operating Theater

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Background: Patient safety is at the center of an efficient healthcare system. Medical errors are a threat to patient safety. It is relatively common in hospitals and is a serious public health problem. Therefore, it is an importance to have efficient activity detection systems in hospitals to detect clinician activities in order to keep mistakes at minimum. This research focuses on designing a system model which allows a computer to automatically identify the physical actions of an anesthetist in the operating theater in order to detect and correct his/her clinical errors. It involves finding suitable technologies to identify activities in the operating theater and designing a prototype system to detect an aspect of clinical work. This paper discusses that our attempt to use of Radio Frequency Identification (RFID) technology to capture anesthetist activities in a simulated operating theater.

The objective of this paper is to answer to the research question whether RFID system could be used to detect an anesthetist's clinical activities in an operating theater.

Methods: An experimental study was set up to use active RFID equipment to detect the activities of an anesthetist in an operating theater. The experimental set up used the active RFID system of AURA Lab of the Auckland University of Technology. The experiments were conducted with clinical trainee staffs at the Simulation Centre for Patient Safety (SCPS) at the University of Auckland, New Zealand. An appropriate simulation suite was set up exactly like a clinical operating theater with clinical trainee staff. A mannequin was used as a patient and the room is provided video and sound recording facilities. Different operating room stories took place with five personnel in the room, an anesthetist, a surgeon, two nurses and an anesthetic technician. As we were tracking the anesthetist's activities only, he wore tags on his parts of body.

Results: For each of the trials the RFID tag's position on each parts of the body, forehead, back of head, front of body, back of body, and wrists was recorded for analysis. Based on the data, the distance traveled by each tag was calculated to measure the movements of anesthetist's body parts.

Conclusion: This paper presents a trial using an RFID tracking system to detect anesthetist activity during anesthesia, in order to investigate whether the radio frequency identification system can be used to detect an anesthetist's clinical activities in an operating theater. The experiments were organized to detect the anesthetist's activities in a realistic operating theatre environment with clinical trainee staffs and a mannequin in a simulated operating theater. Several operating room scenarios were run to obtain the RFID data. However, we noticed that the RFID data we collected were noisy and incomplete. Because the RFID readings were influenced by the effect of multi-path reflection and attenuation due to the large amount of metal surfaces presented in the operating room. This study demonstrates that the RFID sensor system could be used to detect some characteristics such as total distance travelled by the anesthetist and his/her rotational movements during the operations. This is because the data was not completely captured by RFID system in the operating theater environment due to multi-path reflection and attenuation issues. Therefore, the further investigation is required to use active RFID sensor system to detect anesthetist activities in the operating theater.

KEYWORDS: Anesthesia, Clinical activity detection system, Clinical errors, RFID sensors