

DEVELOPMENT OF A DISPOSABLE WIRELESS SENSOR FOR MONITORING PATIENT MOVEMENT

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Introduction

Pressure ulcers place a significant financial burden on the healthcare industry. Each year approximately 2.5 million Americans will suffer from a pressure ulcer and the annual cost of treating these ulcers is estimated to be as high as \$11 billion¹. Despite a growing emphasis on prevention, pressure ulcers continue to be one of the most common preventable hospital-acquired conditions². It is well established that frequent and regular patient turning is a key element to pressure ulcer prevention. The currently accepted standard of care is to turn high-risk patients at least every 2 hours, day and night. In many healthcare facilities, such a turning protocol is difficult to maintain. Prior studies have estimated that compliance with these protocols is only ~66%^{3,4}.



A disposable, wireless sensor is applied to patient's upper torso.

Objectives

To address the need for improved pressure ulcer prevention methods, we sought to develop a system that provides caregivers with information regarding a patient's position over time, thus enabling them to easily identify which patients are turning adequately on their own and which patients are in need of a caregiver-assisted turn.

Methods

A disposable, wireless sensor is affixed adhesively to the patient's upper torso. The sensor takes measurements of the patient's orientation and communicates this data wirelessly to a mesh network of relay antennas. The mesh network communicates data from the sensors to a server computer having an RF to USB transceiver. The network server software collects patient data from the transceiver and stores the data into an SQL database for subsequent analysis. A user-interface displays each patient's turn history and current status and also alerts staff if any patient requires a caregiver-assisted turn.

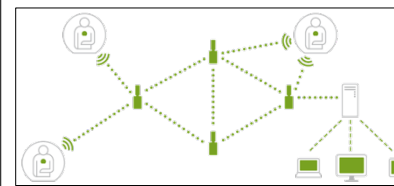
Results

The monitoring system was successfully tested in a clinical environment. The sensor was used to continuously monitor and record the position/movement of over 100 patients. The user-interface was used to successfully coordinate patient turning efforts and ensure compliance with such efforts.

Room	Patient	Time Until Next Turn	Position	Information
2301	M.S.	1:57	L B R	Upright
2302	C.M.	0:14	L B R	
2303	S.S.	Turn Due 0:03 Over	L B R	
2304	M.L.	1:51	B R	



A user-interface displays the real-time position and turn history for each patient.



Sensor data is wirelessly communicated through a network of relay antennas and viewable on computer terminals or mobile devices.

Conclusions

Factors that impair compliance with turning protocols include difficulty monitoring patient position, ineffective turn reminders/alerts, and sub-optimal caregiver staffing ratios. In this study, we developed a system to monitor patient turning patterns and to explore the possibility of improving turning protocols through the implementation of novel IT policies/procedures. The system may be used to monitor and manage turning protocols in perioperative and critically ill patients.

References

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