

Pressure Relief Compliance Monitor for Wheelchair Users

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Clinical Problem

A pressure ulcer (PU) is localized injury to the skin and/or underlying tissue usually over a bony prominence, as a result of pressure, or pressure in combination with shear (European Pressure Ulcer Advisory Panel (EPUAP) and National Pressure Ulcer Advisory Panel (NPUAP) 2009). Pressure ulceration is a well recognized complication in patients with mobility impairment and has become a recent focus of attention due to new legislation pertaining to acute hospital reimbursement. As part of the Deficit Reduction Act of 2005, the Centers for Medicare and Medicaid Services (CMS) sought to contain costs by refusing payment for adverse events in hospitalized patients that were felt to be preventable which included PU. The incidence of new pressure ulcers in acute care adult patients is around 7%, with wide variability among institutions.[1] The incidence in the pediatric population is not well described.[2] Estimated costs associated with PU as a secondary diagnosis in hospitalized patients averages \$43,180 per hospital stay.[3] While recent focus has been directed to PU in hospitalized patients, this phenomenon is not confined to those who are bed ridden.

One patient population at particular risk for PU is persons with spinal cord injury. The combination of paralysis resulting in prolonged periods of sitting in a wheelchair, lack of protective sensation, muscle atrophy, shear forces and potential for excessive moisture all serve to increase the relative risk of PU. The hallmark of effective prevention of PU by the wheelchair user consists of addressing modifiable risk factors such as the frequency of pressure relief maneuvers. This is especially important in the pediatric population who are at additional risk due to their distractibility and varying ability to grasp the importance of effective PU prevention.

Project Goal

Design an inexpensive, durable, lightweight portable pressure monitoring system that could be installed in conjunction with a pressure relieving wheelchair cushion. Pressure sensors would be sufficiently sensitive to detect various methods of pressure relief: side to side, tilt in space seat, forward lean and press ups. Data collected could then interface with a computer as a means to cue the wheelchair user to perform a pressure relief maneuver as needed, or could potentially be automated to remedy an excessive pressure situation for the user.

A prototype device has been created by the CSUS Department of Mechanical Engineering and will undergo testing to determine its potential for clinical use. It is anticipated that this testing will provide important data for the project engineers to refine the current version of the pressure relief monitor. Design specifications for the current prototype may be furnished upon request.

Research Team

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References:

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2. Kottner, J., D. Wilborn, and T. Dassen, *Frequency of pressure ulcers in the paediatric population: a literature review and new empirical data*. *Int J Nurs Stud*. **47**(10): p. 1330-40.
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