Patient Pressure Injury Prevention Methods and Software

Tech ID: 34216 / UC Case 2021-576-0

BACKGROUND

Pressure injuries (commonly called bedsores or pressure ulcers) represent one of the most persistent and costly challenges in healthcare, affecting over 2.5 million US patients and costing almost $27B in 2019. Hospital-acquired pressure injury events occur in about 3% in general populations and about 6% in intensive care units (ICUs). Current prevention strategies still rely on the Braden Scale risk assessment tool as the gold standard. Developed in the 80s, it is used to stratify patients into risk categories based on factors like sensory perception, moisture, mobility, and friction. The Braden score directly informs turning frequency as the standard of protocol. Unfortunately, medical staff adherence to turning protocols remains low at ~50% nationally, creating a gap between prescribed care and actual implementation. Technologies to help assess by sensing pressure injuries have limitations, including discontinuous monitoring requiring manual interpretation, and lack of objective mobility metrics. These fail to account for the complex interplay between pressure distribution, patient movement patterns, and individual risk factors. The Braden-scoring approach is particularly problematic as it does not account for the presence of existing pressure injuries or patient-specific factors, and has been shown to have inadequate validity for ICU patients. Additionally, current pressure mapping systems are typically large, expensive, and require specialized training, limiting their practical deployment in routine clinical care.

TECHNOLOGY DESCRIPTION

To help address these current limitations, researchers at UC Santa Cruz (UCSC) have developed patient pressure injury prevention (PPIP), a new pressure plane analysis approach that computes a 3D pressure plane from sensor array data and tracks changes in angular orientation over time. Using custom methods involving spatial averaging of sensor groups and temporal gradient analyses, PPIP creates movement parameters like "movements per minute" and "movement strength". PPIP incorporates machine learning capabilities for posture classification and introduces novel signal processing techniques including normalized pressure plane calculations and temporal gradient analysis that filter noise while capturing clinically relevant movement patterns. The system can differentiate between assisted and unassisted patient movements and provides predictive capabilities for pressure injury risk based on objective movement patterns rather than subjective assessment scores. Unlike existing systems that provide static snapshots, PPIP is continuous real-time monitoring with automated risk categorization and treatment recommendations displayed to caregivers.

APPLICATIONS

- hospital ICU
- long-term care facilities
- home hospice
- aging in place

FEATURES/BENEFITS

- Objective movement quantification addresses Braden Scale limitations to enable evidence-based care decisions.
- Replaces periodic manual assessments with real-time continuous monitoring for better preventative coverage.
- Creates individualized pressure injury risk profiles based on actual patient movement patterns, potentially improving predictive accuracy.

INTELLECTUAL PROPERTY INFORMATION

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	12,257,065	03/25/2025	2021-576

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OTHER INFORMATION

KEYWORDS

pressure injury, pressure ulcer, bedsore, ICU, long-term care, pressure injury prevention, pressure ulcer prevention, patient monitoring, hospice, intensive care unit

CATEGORIZED AS

- **Computer**
  - Software
- **Medical**
  - Devices
  - Diagnostics
  - Rehabilitation
- **Sensors & Instrumentation**
  - Medical

RELATED CASES

2021-576-0

RELATED MATERIALS

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Decoder-Only Transformer Methods for Indoor Localization
- A Novel Iot Protocol Architecture; Efficiency Through Data And Functionality Sharing Across Layers
- Platooning System and Methods
- Cross-Layer Device Fingerprinting System and Methods
- Smart Deployment of Nodes in a Network

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