

Development and Validation of the Integrated Positioning Index (IPI) for Pressure Injury Prevention

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Introduction: Patient immobility has been linked to a number of serious and costly hospital complications¹. One of the most common complications of immobility is pressure injuries, which affect 2.5 million patients each year and drives up the cost of healthcare in the United States by up to \$11 billion annually². In order to prevent pressure injuries, the standard of care is to turn at-risk patients every two hours, day and night³. Historically, the quality of patient turning protocols has been based on an assessment of the frequency with which patients are repositioned by nursing staff, which is often referred to as the “compliance rate”. However, studies have shown that the *magnitude* of patient turns⁴ (i.e. turn angle) and the amount of tissue *reperfusion time*^{5,6} (i.e. time elapsed between periods of tissue ischemia) are also important components to an effective pressure injury prevention program. Traditionally, there has not been a convenient means to reliably quantify patient turn angles and tissue reperfusion times. To help address the need for improved pressure injury prevention methods, we developed a wireless patient monitoring system (Leaf Healthcare) that continuously monitors the position, movements, and activity of hospitalized patients.

Methods: The Leaf Patient Monitoring System detects all patient turns (including unwitnessed self-turns), the magnitude of each of those turns, and the time that tissues are given to recover from a recent pressure insult. We developed an algorithm that integrates these three parameters into a single index value to give a simplified assessment of the patients’ position distribution history. This index value, called the Integrated Positioning Index (IPI), is designed to provide additional insight into the quality of a pressure injury prevention program. The IPI ranges from 0-100, with higher numbers reflecting a higher level of in-bed mobility/movement. The Integrated Positioning Index (IPI) was clinically validated by correlating data from the Leaf sensor with clinical outcome data from 4 acute care hospitals.

Results: A total of 351,987 hours of sensor data was analyzed from 4,209 patients. The Integrated Positioning Index (IPI) was strongly correlated to pressure injury rates, with higher IPIs correlating to lower pressure injury rates. When the IPI was below 85, the incidence of pressure injuries was 5x higher than when the IPI was greater than 85.

Conclusion: The Integrated Positioning Index (IPI) correlates well with pressure injury rates. IPI provides a comprehensive assessment of the quality of a pressure injury prevention program and can be used as a tool to guide patient care.

References

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