Development of a Novel Solution for Mitigation of Debilitating Decubitus (Pressure) Ulcers, Year Two

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Decubitus ulcers or pressure injuries affect more than 2.5 million individuals in the US alone, causing a greater mortality rate than any single cancer, except lung cancer. Ulcers increase health care costs, interfere with patient recovery, and affect the quality of care in hospitals and care facilities. Preventing them remains a challenge: from using risk assessment charts for ulcer prediction, to inspecting a patient's skin, to regular repositioning of patients and manual records. To predict and mitigate ulcers, I developed a two-step solution that can be integrated into electronic health records systems and automatically predict ulcer risk together with a device for patient monitoring. I used the Medical Information Mart for Intensive Care (MIMIC)-IV data set with 546,028 hospitalizations and 65,366 Intensive Care Unit (ICU) stays to model and automatically predict ulcer risk. I separated the hospital and ICU wards and can predict ulcers before they develop with more than 90% accuracy using only basic lab values, demographic data, and comorbidities. My system is a non-invasive device based on a thermal sensor that automatically tracks patient positioning, all for less than $130. I built three prototypes and ran a clinical study at the local hospital (ICU and ward) where patients were monitored by my device for more than 150 hours. I achieved greater than 99% accuracy in monitoring, and in the future, I intend to take my device to market and expand it to nursing homes and long-term care facilities.

Awards Won: