DEPARTMENT OF BIOMEDICAL ENGINEERING
COLLEGE OF ENGINEERING AND APPLIED SCIENCES

SUMMER RESEARCH OPPORTUNITIES FOR UNDERGRADUATE students

APPLICATION DEADLINE: 03/01/2024

PROJECT TITLE: Convergent Parameter Instrument (CPI): Quantification of Pressure Ulcers using Multimodal Imaging Technologies

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Project Description

Pressure ulcers (PrUs), also known as bed sores, occur when the skin is exposed to pressure for a long period of time. This constant pressure results in decreased perfusion (blood flow) through a localized area of skin. Decrease in perfusion results in injury to the tissue with varying depth and severity. Current guidelines set by the National Pressure Ulcer Advisory Panel (NPUAP) are based solely on observation of the tissue, the wound bed of the PrU, and feeling the affected area for temperature or elasticity changes. Categorization is according to the guidelines (Braden Scale), as shown in Figure 1. This approach is an immense source of error in PrU diagnosis as it is subjective and vague. For example, the NPUAP guidelines state that a Stage 1 PrU may be “painful, firm, soft, warmer or cooler as compared to adjacent tissue”. PrUs have significant patient morbidity and high costs to healthcare facilities. Early detection of erythema can prevent the progression of ulcers at stage I or II to more serious Stage III or Stage IV pressure ulcers.

Total Contact, Inc. is developing the CPI that, in rapid succession, acquires three-dimensional surface, color, thermal, and perfusion images of a localized area on the skin (Fig. 2). This study will determine if the CPI can

capture consistent, quantifiable images of potential and existing PrUs and, when staging pressure ulcers using the CPI vs. current subjective methods, if algorithmic analysis of the image data correlates with current subjective assessment methods.

The student will work with a senior member of Total Contact, Inc. to assist in combining the imaging modalities for an integrated system to be used bedside. Imaging of PrUs will be conducted at Miami Valley Hospital alongside clinicians as they conduct the hospital’s subjective protocol.

The student may be involved in data collection and determine if the CPI can consistently capture quantifiable images of potential and existing PrUs. The student will participate in the application of the image data, extracting parameters of interest such as surface area and color measures, to assess whether algorithmic analysis of CPI image data correlates with the subjective assessment methods currently used.

This project is in collaboration with Total Contact, Inc. and Wright State University.