2025 DFACONFERENCE

ABSTRACT SUBMISSION FORM

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TITLE Diabetic Foot Ulcer Wound Healing Prediction Using Artificial Intelligence Based Automated Thermal Texture Analysis

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ABSTRACT (maximum 450 words. Please use the following or similar headings: Background/Methods/Results/Conclusions)

Background:

Diabetic foot ulcers (DFUs) are complications of diabetes that can lead to infection, hospitalization, or even amputation if not managed effectively. The prediction of wound healing is crucial to improve clinical decisions and patient outcomes. Thermal imaging as a non-contact and non-invasive method can capture information about skin temperature distribution and inflammatory activity. Previous studies have shown the benefits of thermal imaging for monitoring DFUs, but there is limited evidence on the prognostic value of baseline thermal imaging features in predicting healing outcomes.

Aim:

This project aims to develop an Artificial Intelligence powered device that enables clinicians to predict the wound healing status of DFUs using the analysis of thermal imaging captured in the first week of presentation.

Method:

Thermal images were collected using a FLIR camera connected to a smartphone with built-in software. Patients with type 1 or type 2 diabetes were recruited based on specific criteria for a 12-week study. The wound area in the thermal images, the region of interest (ROI) was identified and used to train a model for classifying wound healing status. The healing status at week 12 was assessed by a podiatrist to provide ground truth labels. Model performance was evaluated using the sensitivity and specificity metrics.

Results:

This pilot study collected thermal images from 18 neuropathic DFU patients (9 healed and 9 non-healed wounds) from Week 1 (baseline) and Week 12 (healing status label). The wound areas were segmented from each baseline image to extract the information based on textural features and statistical measurements. The top three significant features were used to train the classifier, which achieved a performance with 0.67 sensitivity and 0.89 specificity. The results show that textural features extracted from the baseline thermal image of the wound area may reflect underlying tissue perfusion and inflammatory processes, supporting their use in early healing prediction.

Conclusion:

Thermal texture features extracted from wound regions at the baseline visit show potential for predicting DFU healing status at 12 weeks. This AI based device contributes to the development of non-invasive tools for early assessment which can support clinicians and improve patient care. Integrating this approach into mobile health applications can enhance access to wound assessment in rural and remote communities. In particular, it can support wound management and monitoring for people in remote places having limited healthcare access, such as those in First Nations communities, by facilitating timely management of healing progress