

## The First Reader Study of Burn Wounds with Predictive Artificial Intelligence Analysis

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### Background

Burn wounds are complex injuries that present a significant challenge, especially when assessing wound severity and the potential for healing or required surgical treatment. To date, no widespread diagnostic technology effectively diagnoses or predicts burn wound healing. A potential solution exists with multispectral imaging (MSI) which captures data across multiple wavelengths of light providing detailed, objective, and quantitative assessment if processed with well-developed artificial intelligence (AI) algorithms. The primary objective of this study was to determine the impact of MSI images processed with AI on clinicians' treatment decisions with a secondary objective to assess provider type.

### Methods

A reader study design was developed which involves multiple independent readers evaluating the same set of images to measure a device's diagnostic reliability and accuracy. Sample size calculations led to the total enrollment of 100 licensed, practicing physicians; 54 emergency medicine (EM) and 46 burn surgeons (BS). A mixed model predicting optimal treatment assignment incorporated 10 different healing and non-healing burn wound images (BWI). Participants independently assessed BWI to make treatment decisions before and after being provided MSI output which highlighted non-healing areas using AI. A composite score of each practitioner's treatment decisions was used to calculate a Clinical Accuracy Score (CAS). Data was analyzed using SAS<sup>®</sup> Proc Mixed and Proc Calis (Cary, NC).

### Results

The probability of making a correct assessment was estimated at 61% before viewing the MSI output. After participants review of the MSI output, the probability of a correct assessment increased to 89%. Furthermore, the odds of making a correct treatment decision were estimated to be 3 times higher ( $p < 0.0001$ ). The average difference in composite scores before and after MSI output was significantly improved ( $p < 0.0001$ ). We found no significant differences between provider types when comparing EM and BC ( $p = 0.5332$ ).

### Conclusion

Approximately 1% of hospitals have a verified burn center in the US, limiting access to specialized care. This study demonstrated that MSI processed with AI is a valuable tool for burn wound assessment, offering high reliability, improved diagnostic accuracy, and greater objectivity compared to traditional methods. This technological advancement may help clinicians standardize burn wound evaluation across providers and settings and reduce unnecessary transfers and hospital stays while offering more prudent surgical intervention. Future research should focus on integrating this technology into clinical workflows and exploring its potential application in prehospital settings, telemedicine, and military operations.