

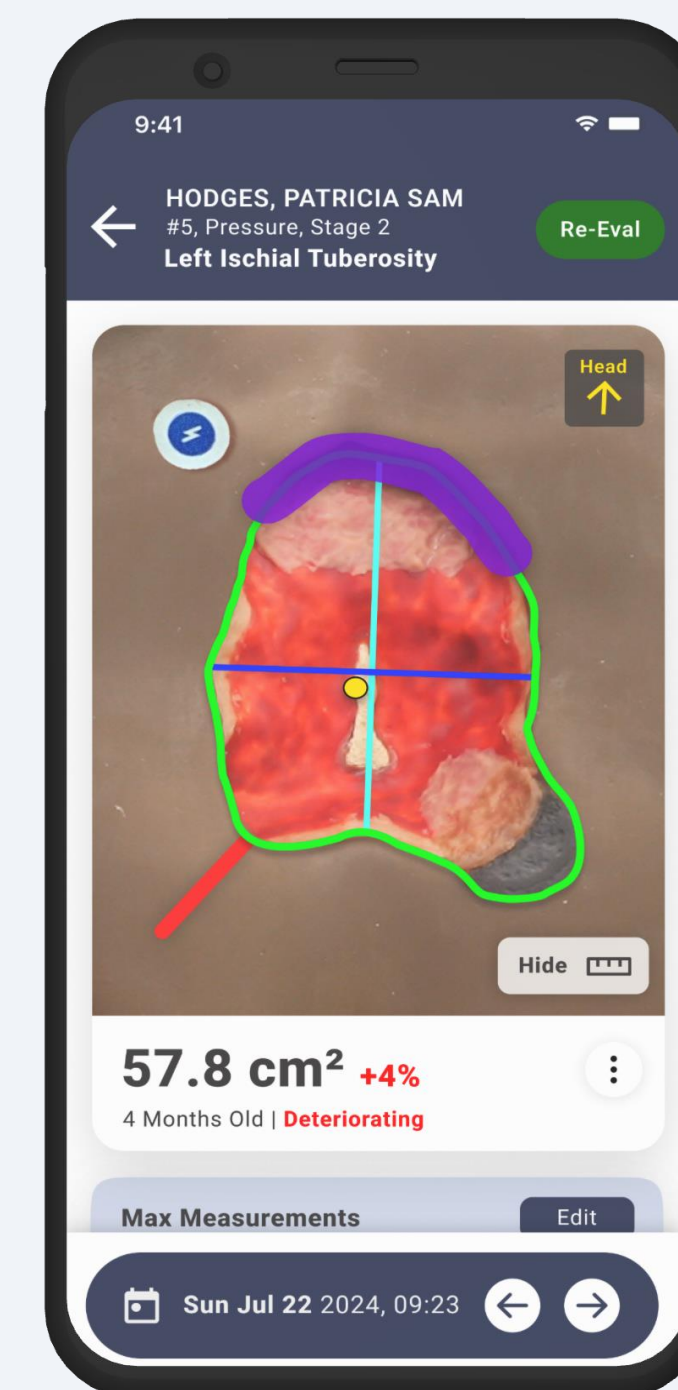
# A Closer Look at Wound Tissue Identification: Clinician Variability and Value of AI-Based Segmentation

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## Overview

- Wound healing is a dynamic and complex process with a series of interactions between various cell types and tissue formation and requires precise identification of four types of tissue: granulation, slough, eschar, and epithelialization.<sup>1,2</sup>
- Granulation tissue can present across a spectrum (e.g., healthy red, pale pink, early-stage, or hypergranulated), which may introduce variability in clinician interpretation and contribute to confusion with other pink/red wound bed components such as blood or inflamed tissue.
- Early epithelialization can also be subtle and variably interpreted by clinicians, as it represents an active healing process rather than a distinct tissue mass, which may lead to inconsistent identification across observers.<sup>3</sup>
- Inconsistent wound care assessment delay interventions, impact patient outcomes and increase costs.<sup>4</sup>
- AI-based segmentation offers standardized, objective assessment to improve consistency and support clinical decision-making.<sup>5</sup>



## Objective

- To assess inter-clinician agreement in identifying and quantifying wound tissue types
- To evaluate the correlation between clinician assessments and AI-generated tissue measurements

## Methodology

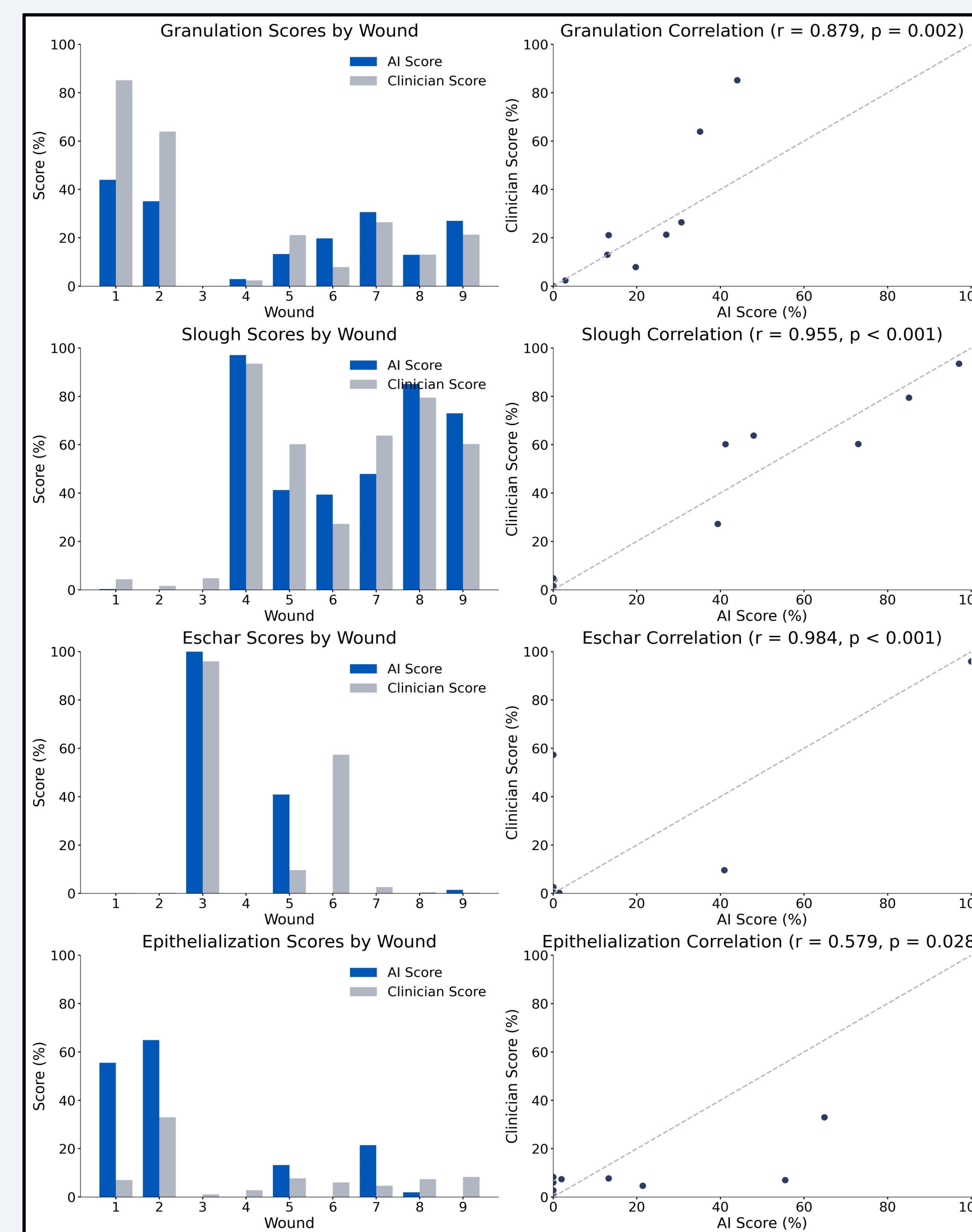
- Study Design:** Cross sectional survey
- Recruitment:** 50 wound care clinicians recruited through conference outreach and professional networks
- Participants:** Wound care clinicians including registered nurses, nurse practitioners, physician assistants, nurse specialists in wound care, and physicians with formal wound care training
- Assessment Protocol:**
  - Participants completed demographic and experience questions
  - Reviewed nine anonymized AI-captured wound images with diverse tissue compositions and skin tones. For each image, identified presence/absence of the four tissue types and estimated percentage.
- Comparison Standard:**
  - AI-based segmentation tool (SmartTissue™) analyzed identical images
- Statistical Analysis:**
  - Intraclass correlation coefficients (ICC) to measure inter-clinician agreement
  - Pearson correlations (r) to assess clinician-AI alignment

## Results

### Clinicians' Demographics and Confidence Level

- Registered nurses (60%), nurse specialists (10%), nurse practitioners (6%), physician assistants (8%), physicians (16%).
- 75% reported confidence in identifying tissue types, only 54% felt confident quantifying tissue percentages.
- Wound care specialists demonstrated highest confidence levels (94.4% for identification, 66.6% for quantification).

### AI-Clinicians Agreement by Tissue Types Across Wounds



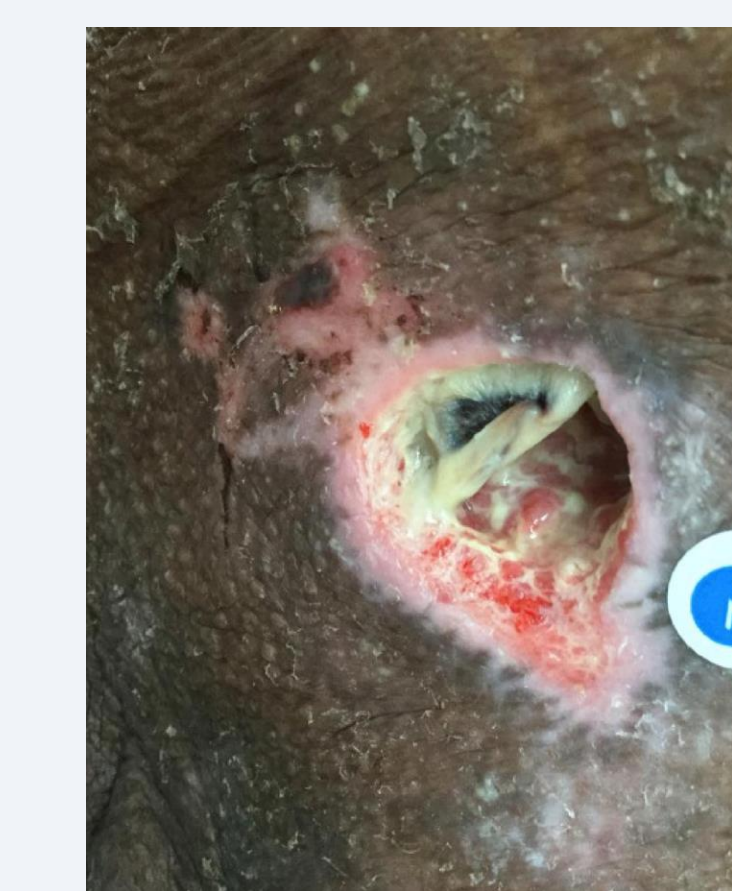
- Strong alignment between clinician and AI scores was observed for granulation, slough, and eschar ( $r = 0.88-0.98$ ;  $p \leq 0.002$ ), with high correlations across wounds, reflecting consistent scoring patterns.
- Lower agreement was seen for epithelialization ( $r = 0.579$ ;  $p = 0.028$ ), consistent with greater clinician variability for this tissue type.
- More consistency was found in the AI system's evaluation of epithelialization, supporting its potential value as a supplementary tool for challenging tissue evaluation.

### Inter-Clinician Agreement by Tissue Type Across Wounds

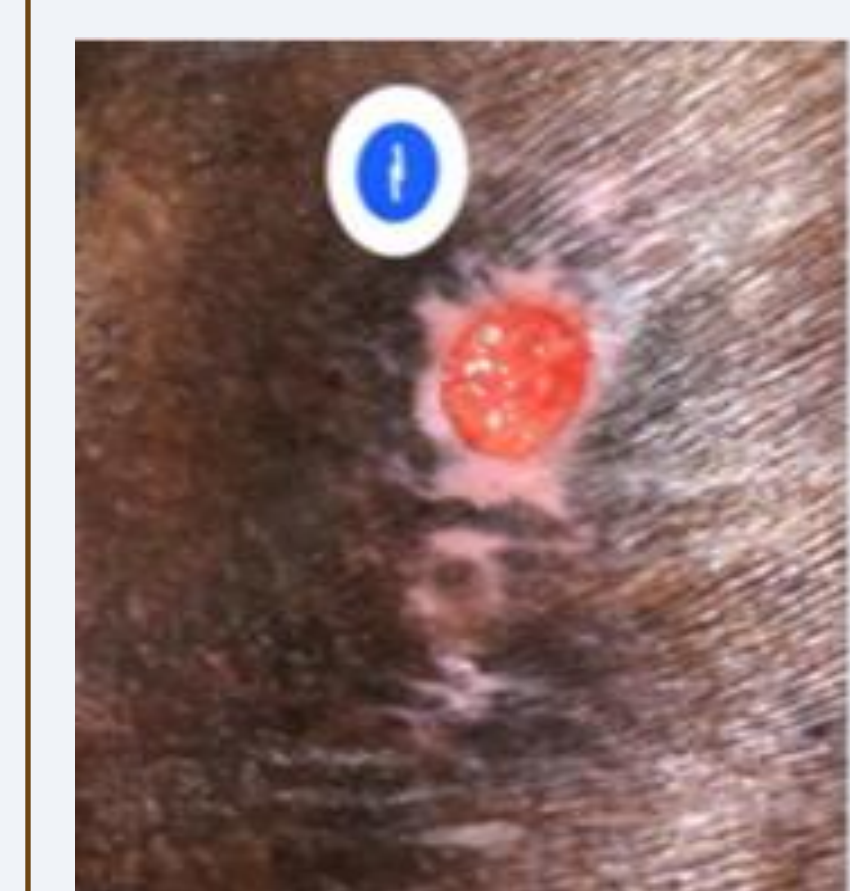
Tissue Type	ICC	Agreement Level	Identification Rate
Eschar	0.910	Excellent	87%
Slough	0.762	Good	84%
Granulation Tissue	0.763	Good	82%
Epithelialization	0.435	Poor	60%

- High agreement for eschar, granulation, and slough (ICC 0.76–0.91; 82–87% correctly identified).
- Low agreement for epithelialization (ICC 0.435; 60% accuracy), even among specialists (ICC 0.553).

### Variability in Epithelialization Assessment Across Wounds



Thin epithelialization at wound periphery demonstrated low contrast against dark skin. Prominent slough (52.8%) and granulation (23.3%) drew visual attention to wound center. AI's pixel-level edge analysis detected peripheral epithelialization missed by clinical assessment.  
**Epithelialization Gap: 37%** (Clinicians 8.5% vs AI 45.5%).



Uniform epithelial rim blended with dark surrounding skin while central granulation (81.0%) dominated visual field. AI's edge detection identified peripheral epithelialization overlooked clinically.  
**Epithelialization Gap: 48%** (Clinicians 7.2% vs AI 55.5%)

## Conclusion

- Inconsistent tracking and reporting may cause delays in intervening in non-healing wounds or change in treatment of a wound that is objectively improving.
- Epithelialization, a crucial indicator of wound healing progress often characterized by subtle color changes in the wound bed, was consistently underestimated by clinicians – particularly in darker skin tones.
- AI can focus clinical decision making on reviewing trends and acting on clinical judgement by improving the consistency of tissue typing

## References

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