**INTRODUCTION**

- Current gold standard technique for tissue management in diabetic foot ulcers (DFUs) is regular sharp debridement to reduce bioburden, as this optimizes effectiveness of antimicrobials and stimulates wound healing.
- However, the extent of debridement required to reduce bioburden based on visual inspection is unclear, as point-of-care detection of bioburden relies primarily on visual inspection of wounds and subjective and suboptimal clinical signs and symptoms.
- To address this problem, fluorescence imaging has been used to visualize red-fluorescing bacteria in real-time at the bedside using a non-contact device.
- This study reports the use of bacterial fluorescence imaging to assess pre- and post-debridement bioburden and to selectively target secondary/additional debridement to regions of bacterial burden.

**METHODS**

**Bacterial Fluorescence Imaging**

- When excited by 405 nm violet light, tissues fluoresce green while bacteria fluoresce red (e.g. *Staphylococcus aureus*).
- This enables real-time, point-of-care detection and localization of bioburden (≥ 10^4 CFU/g) within and around wounds.
- Bacterial fluorescence imaging was incorporated into 22 routine wound assessments of 12 DFUs classified as “healable.”
- Initial curette debridement aggressively removed multiple layers of tissue on and around the wound, according to current best practices.
- Fluorescence images were acquired after initial debridement. When deemed clinically appropriate, fluorescence images were then used to target remaining regions of bioburden through additional debridement.

**RESULTS**

- **Pre-debridement**: After initial debridement, 11/22 wounds (50%) showed bacterial fluorescence at loads ≥ 10^4 CFU/g.
- **Post-debridement**: 16/17 wounds (94%) no longer showed detectable fluorescence.

**Bacterial Fluorescence Guides More Aggressive, Targeted Debridement and Insight for More Frequent Debridement**

- **Pre-debridement**: 17/20 DFUs showed red fluorescence indicating bacterial bioburden.
- **Fluorescence-guided debridement**: 16/17 (94%) of that bioburden was removed.

**CONCLUSIONS**

- Red (bacterial) fluorescence was present in 100% of DFUs after initial, aggressive standard of care debridement. This is especially concerning given that red fluorescence equates to a bacterial load of ≥ 10^5 CFU/g or higher (i.e. moderate/heavy bacterial load).
- Thus, results of this study demonstrate that current best DFU debridement practices of visual inspection and clinician judgement: 1. do not maximize removal of bioburden, 2. leave behind an unacceptable high bacterial load (≥ 10^5 CFU/g) that is considered detrimental to wound healing, and 3. fail to optimally prepare the wound for antimicrobial dressing/treatment.
- Incorporation of bacterial fluorescence imaging into routine DFU wound care resulted in more aggressive debridement. This specifically targeted regions of bioburden, and avoided unburdened tissue, providing a more optimal state for healing.
- Results highlight the potential of bacterial fluorescence imaging to dramatically improve current debridement practices by enabling point-of-care, bioburden based decision making on which tissue, and how much tissue, to selectively remove.

**FUTURE DIRECTIONS**

- The ultimate goal of debridement intervention is to increase (1) a wound's ability to heal and (2) wound healing rates. Wound healing rates have not yet been incorporated into this study.
- In future, upon closure of these wounds, a retrospective analysis is planned to compare average healing rates in these twelve patients, debrided regularly under fluorescence guidance, with a separate cohort receiving standard of care only.

**REFERENCES**