INTRODUCTION

- Chronic wounds requiring hospitalization often harbor a high bacterial burden that negatively impacts tissue healing¹.
- Knowledge of wound bioburden can guide selection of optimal therapies, for example, negative pressure wound therapy devices (NPWT) with instillation of wound dressings in a heavily contaminated wound.
- Real-time, 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 device².
- Herein, we report the use of this point-of-care imaging device to detect the presence of bacteria in four adult patients undergoing NPWT.

METHODS

Bacterial Fluorescence Imaging

- When excited by 405 nm violet light, tissues fluoresce green while bacteria fluoresce red (porphyrin-producing) or cyan (pyoverdin-producing Pseudomonas aeruginosa).
- This enables real-time, point-of-care detection and localization of bioburden (≥ 10⁵ CFU/g) within and around wounds³.

RESULTS

Case 1: Detection of Bioburden Under Sealed Adhesive Prompts Change in Treatment Plan and Expedite Dressing Changes

85-year-old female, deep sacral ulcer. Fluorescence imaging enabled detection of bacterial fluorescence under sealed, optically-transparent (routine) adhesive prior to dressing changes, on foam dressings, within the wound, and on peri-wound tissues.

Week 1

Red fluorescence observed prior to NPWT dressing change

Week 2

Red fluorescence (arrow) observed within wound and peri-wound region

Week 3

Foam dressing

Week 4

Effectiveness of NPWT + instillation demonstrated; only small region of red (bacterial) fluorescence remained (circled).

Case 2: Fluorescence Images Provide Confidence to Delay Dressing Changes, Avoiding Disturbance of Wound Bed

45-year-old female with large, pectoral necrotizing fasciitis wound undergoing NPWT. Images taken over 6 weeks were consistently free of red fluorescence, (confirmed by swab results). Based on images, clinician delayed several dressing changes by 24 hours, leaving the wound undisturbed for better healing and saving clinician time and resources.

Week 1

Red fluorescence observed under adhesive (circled) and on wound. Fluorescence imaging enabled delayed dressing change: fluorescence was negative for red fluorescence.

Week 2

Below, images taken of wound bed and foam dressing during dressing change (week 6) were also negative for red fluorescence.

Week 3

Fluorescence images of bacteria help guide selection of appropriate and most cost-effective NPWT (standard vs. instillation), demonstrating its potential to effect health economics.

CONCLUSIONS

- Bacterial visualization in real-time helped to guide:
  - bioburden-based, personalized treatment regimens,
  - clinician selection of NPWT with or without instillation of wound dressers, and
  - the extent and location of wound cleaning during dressing changes.

- Visualization of bacteria prior to removal of adhesive and dressings led to expedited dressing changes when heavy bioburden was detected and postponement of dressing changes for 24 hours when red fluorescence was not observed, avoiding unnecessary disturbance of the wound bed.

- Fluorescence imaging of bacteria guided help selection of the appropriate and most cost-effective NPWT (standard vs. instillation), demonstrating its potential to effect health economics.

- These results highlight the ability of bacterial fluorescence imaging to provide invaluable, real-time information on a wound’s bioburden, contributing to clinician treatment decisions in cases where bacterial contamination could impede wound healing.

Handheld real-time fluorescence imaging of bacteria guides treatment selection and timing of dressing changes in inpatients undergoing negative pressure wound therapy

Case Series

- Three wounds with diverse etiologies were imaged with the fluorescence imaging device at various stages of the wound healing process.
- Wounds that were positive for red fluorescence signal were considered to be contaminated with bacteria.

REFERENCES

5. Reuser MJ et al. Point-of-care fluorescence imaging positively predicts the presence of pathogenic bacteria in wounds at beds 10–100x greater than cultures. Wound Care Auto Care (submitted)