Color Blind Clarity: Preventing Pressure Injuries Using Thermography in Long-Term Acute Care Hospitals

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PURPOSE:

Patients with darker skin tones are at risk for DTPIs at almost double the rate of patients with lighter skin.[1] With racial diversity increasing across the US and an estimation that darker-pigmented nationalities will comprise over half of the population by 2050 [2], utilizing skin assessment protocols that reduce disparity is imperative. Long-wave infrared thermography (LWIT) is a multimodal technology used for the early detection of deep tissue pressure injuries (DTPIs) and wound measurement. Using LWIT allows for earlier recognition of skin abnormalities in patients of color, leading to timely prevention efforts and treatment. With goals of decreasing hospital-acquired pressure injuries (HAPI), standardizing wound assessment, and decreasing disparity in healthcare, LWIT was implemented in ten Long-term Acute Care Hospitals.

MATERIALS:

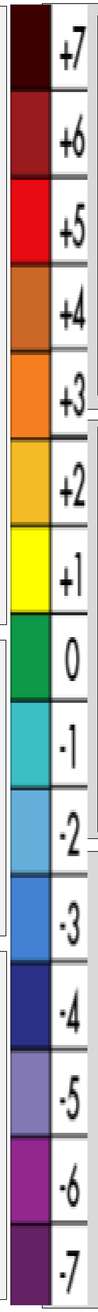
LWIT device and software:

- Hand-held, non-radiating, non-invasive, and non-contacting
- Photographic documentation with accurate, repeatable wound size measurements
- LWIT reveals physiologic markers and objectively measures inflammation, perfusion, and metabolic activity26

METHODS:

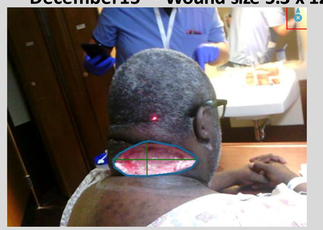
Social Determinants of Health (SDOH) reveal potential disparities for patients of color. These disparities have a negative impact on outcomes; therefore, a standard of care was implemented to include:

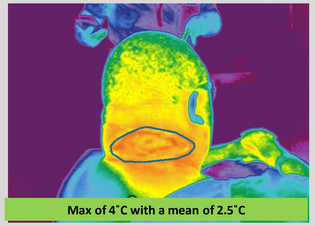
- LWIT images within 24 hours of admission and weekly for patients having a Braden score of 12 or less.
- An individual care plan, including evidence-based prevention and/or treatment bundles.



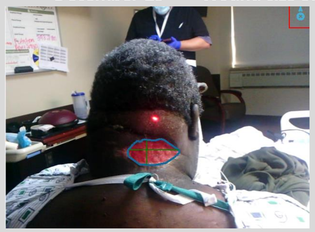
Case 1. Hospital A

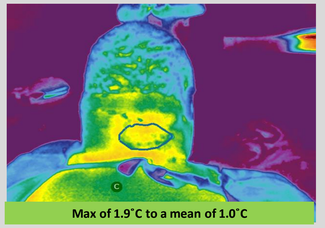
December15th - Wound size 5.3 x 12.5 x 4 CM (volume 264 cubic cm)





December 25th – Wound size 3.8 x 7.5 0.2 cm (volume 5.7 cubic cm)

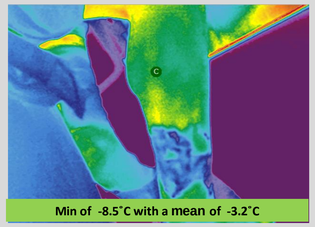




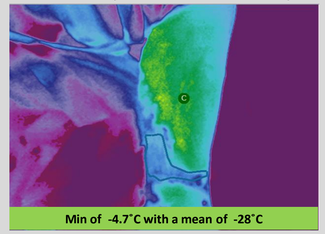
- Neck abscess with a history of diabetes and prior abscess in the same area over 5 years.
- Education was provided on diabetic wound healing, leading to improved compliance with dressing changes.
- Digital and thermal images, respectively, show the healing process and temperature improvements.
  - The images excited the patient, who asked questions and saw progress each week.
- At 6 weeks: 98% wound size reduction. Wound bed temperature from a max of 4˚C with a mean of 2.5˚C on 12/15 to a max of 1.9˚C to a mean of 1.0˚C on 1/25-normal range
- **Note that on December 15th The thermal image shows widespread heat outside the wound bed, and the digital image shows no redness.**

Case 2. Hospital B

December 11th - Wound size 7.6 x 8.9 x 0.3 cm (volume 20.3 cubic cm)



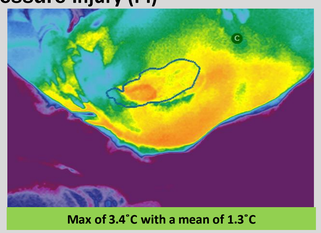
December 25th - Wound size 7.3 x 9.2 x 0.1 cm (Volume 6.7 cubic cm)



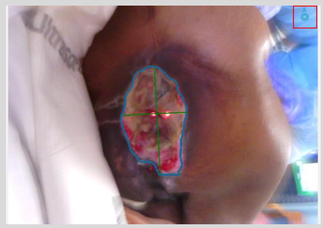
- A 50-year-old with a medical history of COPD, HTN, and morbid obesity has been diagnosed with chronic bilateral lower extremities ulcers due to mixed venous insufficiency/PVD -right leg is shown.
- Patient's NPWT tolerance is poor; dressing changed thrice weekly; provider warned of non-healing and amputation risk.
- Mentation changed; infection suspected. Dark skin complicates assessment, but the thermal image shows no inflammation. The wound and urine were cultured, with confirmation of positive Flu-B. LWIT provides accurate monitoring and supports the lack of leg involvement for infection during hospitalization.
- At 2 weeks: 67% reduction in size. Wound bed temperature on December 11th, a minimum of -8.5˚C; December 25th, a minimum of -3.5˚C.
- **Note the improved wound bed temperatures migrating toward the center of the scale.**

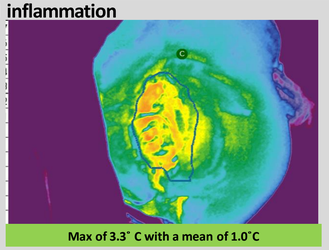
Case 3. Hospital C

October 17th - Admit with Open Pressure Injury (PI)



October 30th - PI with decreased inflammation

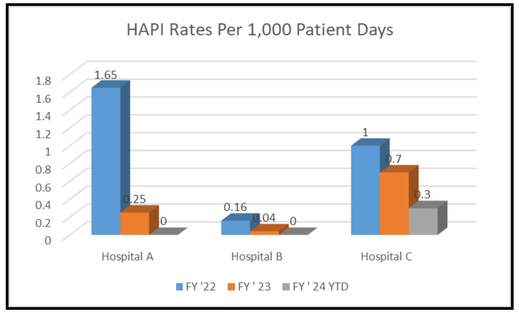




- A 49-year-old patient with a history of CVA, DM, hemiplegia, and ESRD has been admitted for ventilator weaning, hemodialysis, rehabilitation, and wound care of a sacral pressure injury. They recently experienced unresponsiveness and hypoxia during dialysis, requiring intubation, tracheostomy, percutaneous feeding tube placement, and treatment for leukocytosis and sepsis.
- Upon admission core temperature average 98.9˚F with a max of 99.9˚F; WBC 24.9, with request for aggressive treatment.
- Oct 17th thermal image: inflammation/infection beyond wound bed outline, max temp 3.4˚C, mean 1.3˚C.
- Oct 30th thermal image: inflammation/infection condensed to wound bed area, max temp 3.3˚C, mean 1.0˚C.
- **Note that the thermal image on October 17th shows widespread inflammation; the image on October 30th shows a much smaller area of inflammation. Despite the substantial inflammation, the digital image does not visualize the erythema (a known dark skin assessment challenge). LWIT image indicated the areas of inflammation heat concern and the improvement on serial images.**

RESULTS:

The fiscal year 2023 prevalence rate decreased to 0.12 from 0.94 in fiscal year 2022.



CONCLUSIONS:

Understanding SDOH utilizing thermography guides the early detection and management of pressure injuries in patients with darker-pigmented skin tones—this improved clinical outcomes, transcending disparity in wound management as evidenced by the cases illustrated. Clinician and patient education involving LWIT increased compliance with the care plan and supported patient participation. Don't be color blind - cultivate objective color awareness with thermography.

Temperature Scale (Relative Degrees Celsius)

REFERENCES:

1. Sommers M. Color awareness: Amust for patient assessment. Published January 11, 2011. Accessed October 9, 2023. https://www.myamericannurse.com/color-awareness-a-must-for-patient-assessment/
2. Black J, Cox J, Capasso V, et al. Current Perspectives on Pressure Injuries in Persons with Dark Skin Tones from the National Pressure Injury Advisory Panel. *AdvSkin Wound Care*. 2023; 36(9): 470-480. DOI: 10.1097/ASW.0000000000000032. EPUB 2023 AUG 7. PMID: 37590446
3. Black J. Using thermography to assess pressure injuries in patients with dark skin. *Nursing; 2018;* 48(9): 60–1.