

# Not Every Patient is the Same: Comparing Energy Needs for Wound Healing Using Predictive Equations vs Indirect Calorimetry Measurements Kristen Alario, BSN, RN, CWON; Annalisa Tsai MS, RDN

### **Study Overview and Method**

#### PURPOSE:

- the variance estimated Demonstrate between (predictive equation) and measured TEE (IC)
- Demonstrate how predictive equations cannot account for patient-specific wound variances

METHOD: Observational Study

**RESEARCH QUESTION:** Can predictive equations account for changes in wound size and patient-specific variability when determining TEE?

STUDY DATES: September 2022 – July 2024 SAMPLE SIZE: 29 INCLUSION / EXCLUSION CRITERIA: No patients were

excluded from participation

# Background

Wound healing, influenced by factors like **nutrition**, can take months, impacting daily life. Malnutrition delays healing, while excess intake causes weight gain.

Wound patients need extra energy for tissue repair, but how much?

Without an indirect calorimeter (IC), we estimate total energy needs (TEE) using a general equation (30-35 kcal/kg). IC, the gold standard, measures resting energy expenditure (REE), adjusted by an activity factor (AF) for daily living.

# **Literature Review Significance**

In a 1999 study by Stephenson, et al. IC was used as part of the care coordination for 32 patients with wounds in a longterm care facility. Their data supported an individualized approach significantly decreased heal time and cost.

A similar study from 1985 also studied this method of analysis on burn patients and ultimately concluded the use of indirect calorimetry was valuable in detecting over or undernutrition to the patients (Saffle, et al. 1985).

# **Study Design and Procedure**

#### **DESCRIPTION:**

- The study was conducted at the Wound Care Clinic at Endeavor Health Swedish Hospital. Nurses recruited participants during their clinic visits, explained the study, and obtained consent. Data was collected using an Indirect Calorimetry (IC) machine by the RD and Wound Clinic Administrator/Nurse monthly for up to six months or until wound healing completed.
- Before testing, patients fasted for five hours and avoided exercise or smoking for at least two hours to ensure accurate resting energy expenditure (REE) measurements. Patients lay with their head elevated at 35 degrees, wearing a clear helmet covered with a single-use canopy to trap the gasses. A tube connected from the helmet to the machine analyzes the oxygen and carbon dioxide exchange rate to determine REE. Measurements took 10-20 minutes. The predictive equation for total energy expenditure (TEE) was then compared to IC-measured needs.



# **Data Analysis Methods**

A paired samples t-test compared the estimated TEE at 30 kcal/kg and 35 kcal/kg. On the graph, measured TEE is shown on the left and predicted TEE on the right. A straight line would indicate perfect agreement between measured and predicted values. However, no line is completely horizontal, meaning predictions differ from measurements. The 30 kcal/kg estimate shows less variation from measured values than the 35 kcal/kg estimate.



TEE

IMPLICATION OF FINDINGS: The patient's measured values were closest to the predictive model at 30kcal/kg but were still significantly different; proving that the predictive model did not accurately capture the body's needs. In all 29 cases, using the predictive equation would have either over or under fed the patient. The predictive TEE never matched the measured TEE.

By utilizing indirect calorimetry to obtain accurate total energy expenditure as a part of the plan of care for the wound patient, we can start to **incorporate daily caloric intake into** the treatment regimen knowing that the recommendation would be accurate to that individual.

Ghaly, P., Iliopoulos, J., & Ahmad, M. (2021). The role of nutrition in wound healing: An overview. British Journal of Nursing, 30(5), S38–S42. https://doi.org/10.12968/bjon.2021.30.5.s38

Saffle JR, Medina E, Raymond J, et al. Use of indirect calorimetry in the nutritional management of burned patients. The Journal of Trauma. 1985 Jan;25(1):32-39. DOI: 10.1097/00005373-198501000-00006. PMID: 3965736.

E Stephenson, B Guggenheim (1999.) The Effectiveness of Indirect Calorimetry in Improving Pressure Ulcer Outcomes in the Long Term Care Resident, Journal of the American Dietetic Association, Volume 99, Issue 9, Supplement, 1999, Page A120. https://doi.org/10.1016/S0002-8223(99)00816-0



### **Results**

SUMMARY OF KEY FINDINGS:

The p-value of <.0001 at 30 kcal/kg and 35kcal/kg, shows there is significant difference between measured vs predicted

### **Recommendations**

# References

Cereda, E., Klersy, C., Rondanelli, M., & Caccialanza, R. (2011). Energy Balance in Patients with Pressure Ulcers: A Systematic Review and Meta-Analysis of Observational Studies. Journal of the American Dietetic Association, 111(12), 1868–1876. https://doi.org/10.1016/j.jada.2011.09.005