



HAS THE INTRODUCTION OF INDIRECT CALORIMETRY CHANGED HOW WE FEED CRITICALLY ILL PATIENTS LIVING WITH OBESITY ?



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BACKGROUND:

Estimating energy expenditure (EE) in critically ill adults with obesity is difficult, increasing the risk of under- or overfeeding, which can worsen outcomes such as length of stay, mortality, and ventilation days ¹⁻⁵

Indirect Calorimetry (IC), the gold standard for measuring EE, is more accurate than predictive equations like Penn-State University equation (PSU) ^{1,2}. The impact of IC on outcomes and feeding guidelines in this population remains unclear ⁴⁻⁶, warranting real-world evaluation.

AIM:

- Assess if IC has changed clinical practice in CUH ICU
- Evaluate impact on outcomes: ventilation days, infection, LOS and mortality.
- Compare accuracy of predictive equations in estimating EE

METHODS:

- A retrospective chart review of 100 critically ill patients with obesity, n=50 pre and n=50 post IC.
- EE was measured using the COSMED Q-NRG+ IC
- Predictive equations (PSU and weight-based formulae) were calculated for each patient.
- Feeding adequacy and accuracy of estimated EE were assessed using criteria adapted from existing literature as well as clinical judgement.
- Data was analysed using SPSS.
- **Ethical approval:** CREC ECM4(w)09/04/2024 &ECM3(l)02/07/2024

RESULTS:

Figure 1 illustrates the changes in feeding adequacy following the introduction of IC:

- Underfeeding decreased by 27%
- Adequate feeding increased by 23.1%
- Overfeeding increased slightly by 3.8%

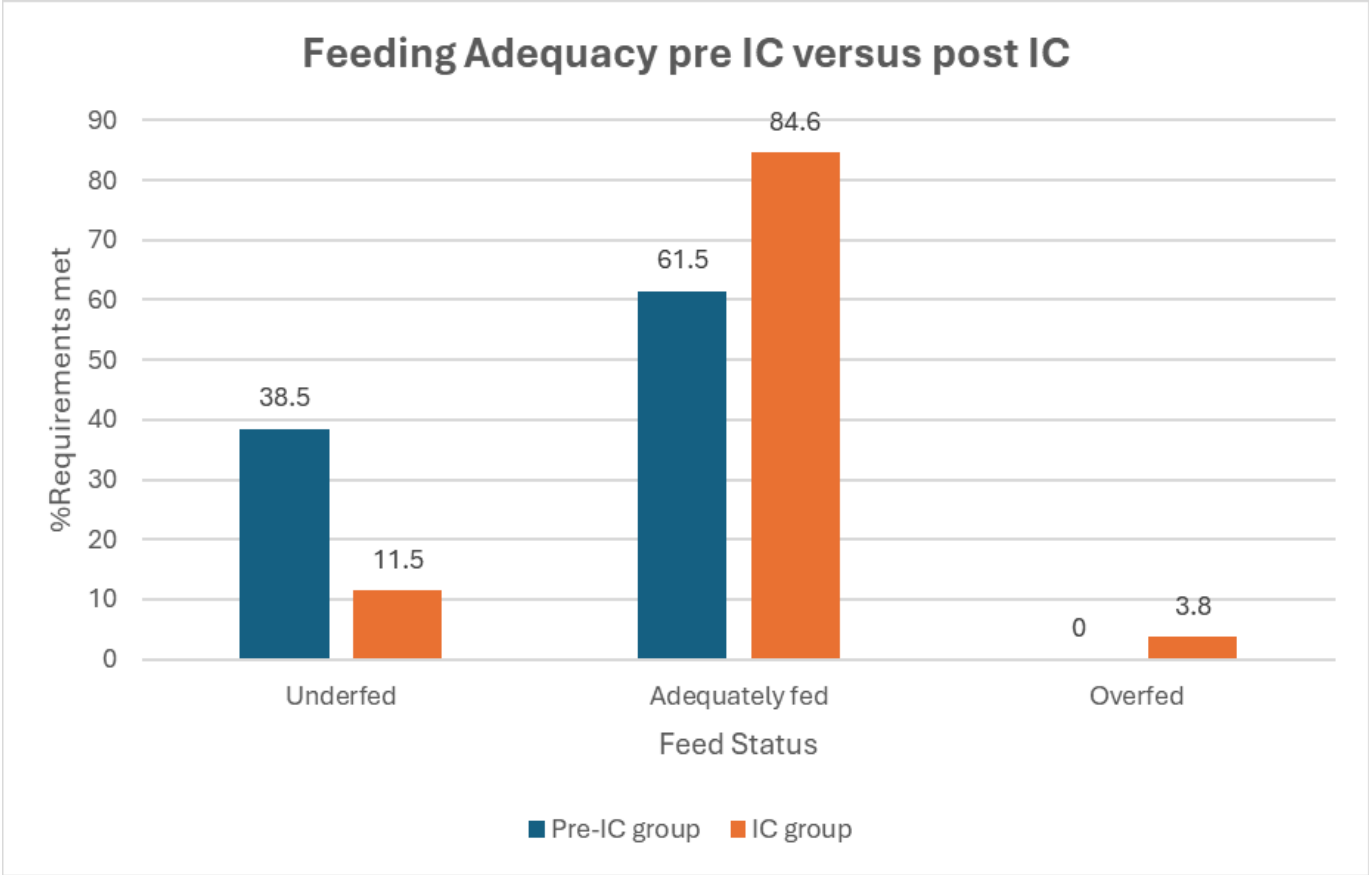
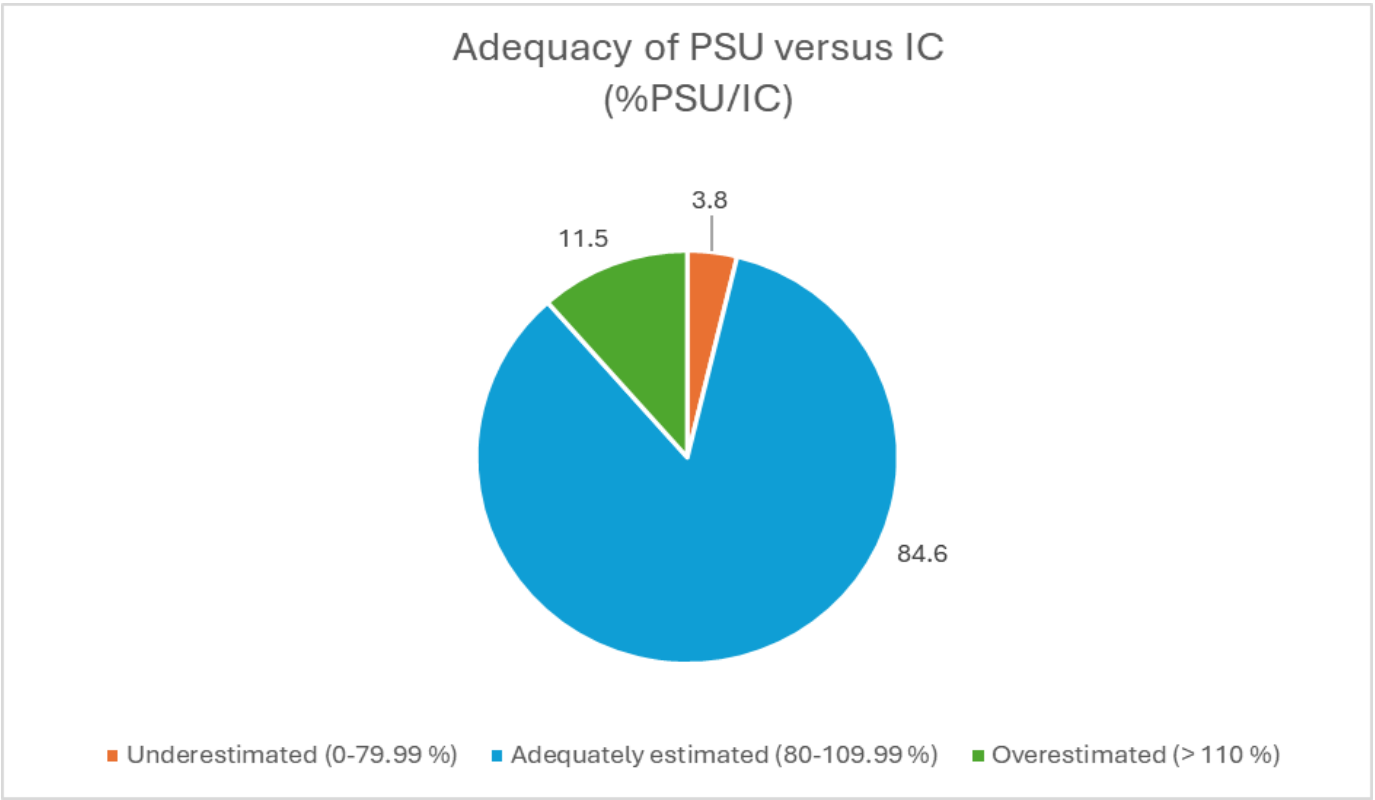


Figure 2 compares estimated EE from predictive equations to IC:

- Median EE via IC was 20kcal/kg
- PSU demonstrated a median EE of 20kcal/kg.
- PSU adequately estimated EE in 84.6% of cases.
- Weight-based equations (11-14kcal/kg) underestimated EE.



Outcomes

A significant reduction in mortality by type (ICU, hospital, and post-discharge) (p = 0.044) overall mortality in the IC group (p = 0.055), with 16 death post-IC versus 30 deaths pre-IC.

CONCLUSION:

Introduction of IC resulted in significant improvements in energy delivery and subsequent reductions in rates of underfeeding. The PSU equation demonstrated reasonable accuracy. However, weight-based recommendations (11–14 kcal/kg) consistently underestimated EE and should be used with caution. Observed reductions in mortality is subject to further analysis for confounding factors.

REFERENCES

1. Delsoglio M, Achamrah N, Berger MM, P1. Pichard C. Indirect Calorimetry in Clinical Practice. J Clin Med. 2019 Sep 5;8(9):1387.
2. Zusman O, Kagan I, Bendavid I, Theilla M, Cohen J, Singer P. Predictive equations versus measured energy expenditure by indirect calorimetry: A retrospective validation. Clin Nutr. 2019 Jun;38(3):1206–10.
3. Jeevanandam M, Young DH, Schiller WR. Obesity and the metabolic response to severe multiple trauma in man. J Clin Invest. 1991 Jan;87(1):262
4. Singer P, Anbar R, Cohen J, Shapiro H, Shalita-Chesner M, Lev S, et al. The tight calorie control study (TICACOS): a prospective, randomized, controlled pilot study of nutritional support in critically ill patients. Intensive Care Med. 2011 Apr 1;37(4):601–9.
5. Singer P, Blaser AR, Berger MM, Calder PC, Casaer M, Hiesmayr M, et al. ESPEN practical and partially revised guideline: Clinical nutrition in the intensive care unit. Clin Nutr. 2023 Sep;42(9):1671–89.
6. McClave SA, Taylor BE, Martindale RG, Warren MM, Johnson DR, Braunschweig C, et al. Guidelines for the Provision and Assessment of Nutrition Support Therapy in the Adult Critically Ill Patient: Society of Critical Care Medicine (SCCM) and American Society for Parenteral and Enteral Nutrition (A.S.P.E.N.). JPEN J Parenter Enteral Nutr. 2016 Feb;40(2):159–211.