

Indirect Calorimetry in Intensive Care – One year on!

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Introduction

Indirect calorimetry (IC) helps Critical Care Dietitians to tailor nutrition support to individual patient requirements. This prevents the well described adverse effects of under- and over-feeding in Intensive Care Units (ICUs) and allows for improved and targeted nutritional care. IC was introduced to Beaumont Hospital for mechanically ventilated ICU patients in April 2024.

Aims / Objectives

To evaluate the use of IC across Beaumont Hospital ICUs over the first year of its application: April 2024 to April 2025.

Methodology

An anonymized excel database was maintained of all IC measurements across ICUs during the first year of use. Data collected included patient characteristics, measured energy expenditure (MEE) and estimated energy expenditure (EEE) for each patient. MEE was compared to EEE (using Penn State equations and 25kcal/kg). ICU Dietitians’ perceptions of challenges and benefits were also recorded.

Results/Findings

- Total number of measurements: n=178, with multiple tests in 15% of patients.
- Average age was 53 years (range 18 to 80 years).
- 68% male.
- Average weight was 79kg (range 41-159kg).
- Body Mass Index (BMI)– see Figure 1.
- Most common diagnoses – see Figure 2.
- MEE versus EEE – see Table 1 and 2.
- Benefits and challenges of using IC – see Table 3.

Conclusions

Measuring energy expenditure using IC is considered the gold standard in ICU. In our critical care population, although overall average estimated energy expenditure results are comparable with average measured results, for individual patients the deviation is highly significant. MEE is, therefore, vastly superior to EEE. From an ICU Dietitian’s perspective, the perceived benefits outweigh the perceived challenges.

Recommendations

Combining body composition measurements with energy expenditure measurements may help monitor efficacy of nutrition support in ICU patients and should evaluate more accurately nutritional outcomes.

Re-audit

We hope to continue to audit and communicate results of indirect calorimetry in our ICUs.

Results / Findings

Figure 1: Body Mass Index (BMI kg/m2)

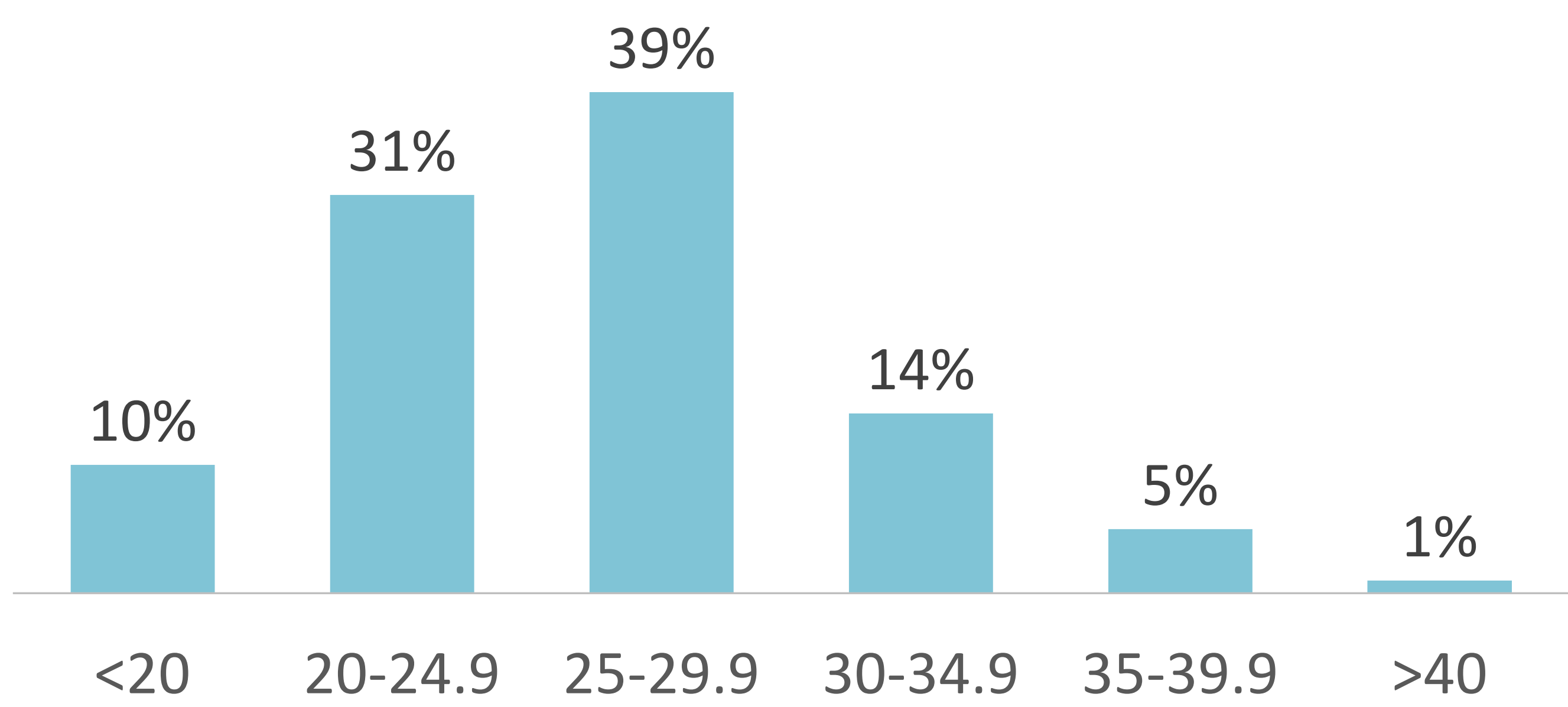


Figure 2: Top 6 diagnoses

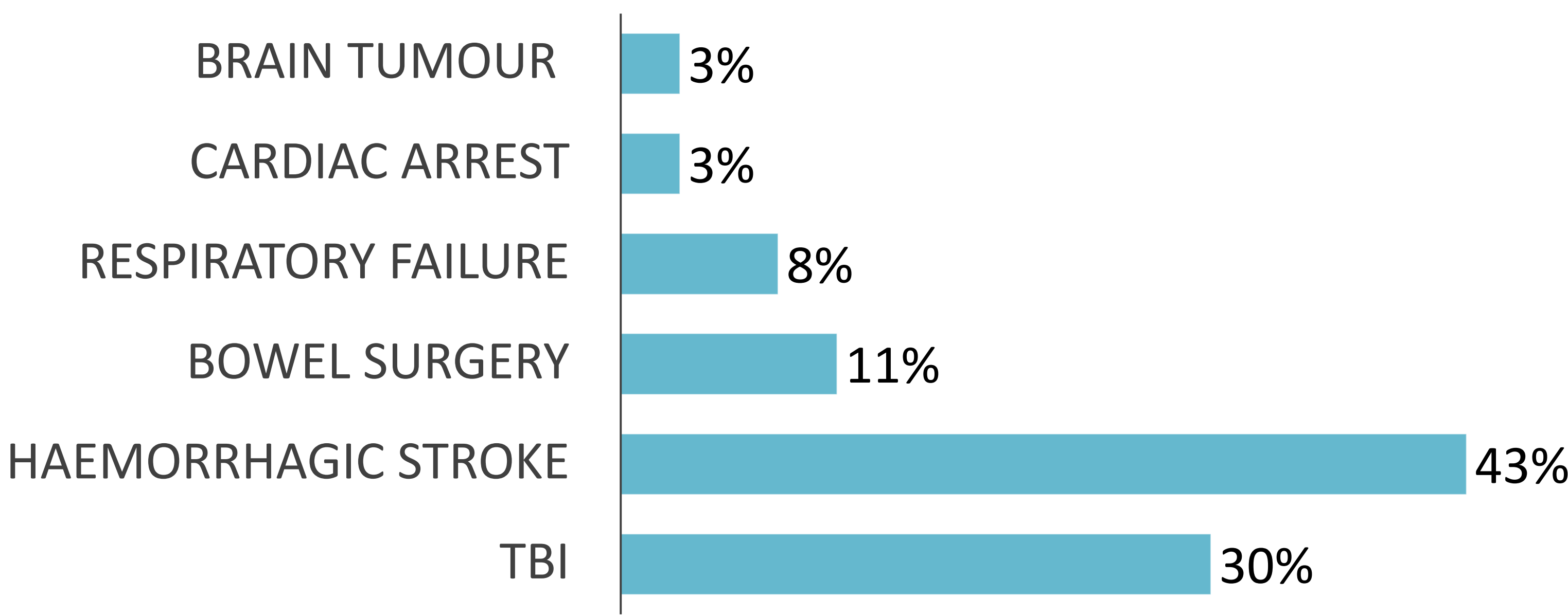


Table 1: Measured (MEE) and estimated (EEE) energy expenditure

Method	Energy (kcal)	Range (kcal)
MEE	1672	649-3279
25kcal/kg	1867	1450-2750
PSU	1843	971-2991

MEE = measured energy expenditure; PSU = Penn State University equations

Table 2: Deviation between MEE and EEE

Method	Average deviation from MEE (kcal)	Range of deviation (kcal)
25kcal/kg	169	-857 to 1190kcal
PSU	145	-579 to 1186kcal

MEE = measured energy expenditure; PSU = Penn State University equations

Table 3: Challenges and benefits of IC (dietetic opinion)

Challenges	Benefits
- Time	- More accurate – weight not needed
- Access to patient and equipment	- More confidence in assessment
- Equipment shortages	- Avoids overfeeding and underfeeding
- Interpretation of results	- May reduce refeeding syndrome issues

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