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Accuracy of predictive formulas to estimate resting energy expenditure of thermally injured patients

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The purpose of this study was to evaluate the bias and precision of 27 published methods for estimating resting energy expenditure (REE) of thermally injured patients. Twenty four adult patients (≥ 20% TBSA burn) admitted to the burn center who required specialized nutrition support and who had their REE measured via indirect calorimetry (IC) were evaluated. Patients with morbid obesity (weight ≥ 150% IBW) or those requiring an FiO_2 > 50% or PEEP ≥ 10 cmH_2O were excluded. One steady state, resting IC measurement (MEE) was obtained per patient. The statistical methods of Sheiner and Beal were used to assess bias and precision of these equations. The formulas were considered unbiased if the 95% confidence interval (CI) for the error (kcals/d) intersected zero and were considered precise if the CI for the absolute error (%) was within 15% of MEE. Data are given as mean ± SD.

N (M/F) 24 (19/5); Age (yrs) 36 ± 12; Weight (kg) 82 ± 21; TBSA (%) 37 ± 15; Burn Severity Index 7.3 ± 2.0; Post-Burn Day 7.7 ± 4.8; MEE (kcals/d) 2780 ± 567; REE (% of BEE) 160 ± 28.

Six methods were biased toward under-predicting MEE, 11 were over-predictive, and 10 were unbiased. None of the formulas were precise. It is recommended that patients with thermal injury be measured by IC to evaluate caloric expenditure. If IC measurements cannot be obtained, the most accurate unbiased methods for estimating resting energy expenditure are 1.5 X Harris-Benedict equations, Cunningham, and Saffle equations.

Table 1. Selected methods commonly used in clinical practice

	Bias (Kcals/day) (95% CI)	Absolute error (mean ± SD, 95% CI)
Modified Curreri (50% burn)	309 to 959	32 ± 34, 19 to 45
Toronto formula	-869 to -280	26 ± 21, 17 to 34
35 kcal/kg/day	-262 to 439	23 ± 35, 9 to 37
1.5 X Harris-Benedict eqs.	-369 to 186	19 ± 24, 10 to 29
Cunningham, 1989	-420 to 74	18 ± 19, 10 to 25
Saffle, 1988	-317 to 391	20 ± 21, 12 to 28