

## Documents

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**Do we need different predictive equations for the acute and late phases of critical illness? A prospective observational study with repeated indirect calorimetry measurements**  
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**Abstract**

**Background:** Predictive equations (PEs) for estimating resting energy expenditure (REE) that have been developed from acute phase data may not be applicable in the late phase and vice versa. This study aimed to assess whether separate PEs are needed for acute and late phases of critical illness and to develop and validate PE(s) based on the results of this assessment. **Methods:** Using indirect calorimetry, REE was measured at acute ( $\leq 5$  days;  $n = 294$ ) and late ( $\geq 6$  days;  $n = 180$ ) phases of intensive care unit admission. PEs were developed by multiple linear regression. A multi-fold cross-validation approach was used to validate the PEs. The best PEs were selected based on the highest coefficient of determination ( $R^2$ ), the lowest root mean square error (RMSE) and the lowest standard error of estimate (SEE). Two PEs developed from paired 168-patient data were compared with measured REE using mean absolute percentage difference. **Results:** Mean absolute percentage difference between predicted and measured REE was  $\leq 20\%$ , which is not clinically significant. Thus, a single PE was developed and validated from data of the larger sample size measured in the acute phase. The best PE for REE (kcal/day) was  $891.6(\text{Height}) + 9.0(\text{Weight}) + 39.7(\text{Minute Ventilation}) - 5.6(\text{Age}) - 354$ , with  $R^2 = 0.442$ ,  $\text{RMSE} = 348.3$ ,  $\text{SEE} = 325.6$  and mean absolute percentage difference with measured REE was:  $15.1 \pm 14.2\%$  [acute],  $15.0 \pm 13.1\%$  [late]. **Conclusions:** Separate PEs for acute and late phases may not be necessary. Thus, we have developed and validated a PE from acute phase data and demonstrated that it can provide optimal estimates of REE for patients in both acute and late phases. **Trial registration:** ClinicalTrials.gov NCT03319329. © 2021, The Author(s), under exclusive licence to Springer Nature Limited.

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