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Comparison of predictive equations for resting metabolic rate in healthy nonobese and obese adults: a systematic review.

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Abstract

BACKGROUND: An assessment of energy needs is a necessary component in the development and evaluation of a nutrition care plan. The metabolic rate can be measured or estimated by equations, but estimation is by far the more common method. However, predictive equations might generate errors large enough to impact outcome. Therefore, a systematic review of the literature was undertaken to document the accuracy of predictive equations preliminary to deciding on the imperative to measure metabolic rate.

METHODS: As part of a larger project to determine the role of indirect calorimetry in clinical practice, an evidence team identified published articles that examined the validity of various predictive equations for resting metabolic rate (RMR) in nonobese and obese people and also in individuals of various ethnic and age groups. Articles were accepted based on defined criteria and abstracted using evidence analysis tools developed by the American Dietetic Association. Because these equations are applied by dietetics practitioners to individuals, a key inclusion criterion was research reports of individual data. The evidence was systematically evaluated, and a conclusion statement and grade were developed.

RESULTS: Four prediction equations were identified as the most commonly used in clinical practice (Harris-Benedict, Mifflin-St Jeor, Owen, and World Health Organization/Food and Agriculture Organization/United Nations University [WHO/FAO/UNU]). Of these equations, the Mifflin-St Jeor equation was the most reliable, predicting RMR within 10% of measured in more nonobese and obese individuals than any other equation, and it also had the narrowest error range. No validation work concentrating on individual errors was found for the WHO/FAO/UNU equation. Older adults and US-residing ethnic minorities were underrepresented both in the development of predictive equations and in validation studies.

CONCLUSIONS: The Mifflin-St Jeor equation is more likely than the other equations tested to estimate RMR to within 10% of that measured, but noteworthy errors and limitations exist when it is applied to individuals and possibly when it is generalized to certain age and ethnic groups. RMR estimation errors would be eliminated by valid measurement of RMR with indirect calorimetry, using an evidence-based protocol to minimize measurement error. The Expert Panel advises clinical judgment regarding when to accept estimated RMR using predictive equations in any given individual. Indirect calorimetry may be an important tool when, in the judgment of the clinician, the predictive methods fail an individual in a clinically relevant way. For members of groups that are greatly underrepresented by existing validation studies of predictive equations, a high level of suspicion regarding the accuracy of the equations is warranted.

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