

VALIDITY OF CURRENT RECOMMENDED DAILY ENERGY INTAKES IN PEOPLE WITH CIRRHOSIS BASED ON INDIVIDUAL PATIENT DATA

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Background: A number of National and International organisations have made recommendations in relation to daily energy intakes in patients with cirrhosis (Table). The advice across guidelines is discordant. Energy intake should balance total energy expenditure (TEE) but accurate TEE data are not available in this patient population so TEE is extrapolated from measured resting energy expenditure (mREE) using the formula $TEE=1.3*mREE$ (*ESPEN guideline recommendation*). This study aims to assess the effects of (i) providing daily energy intakes as per the available guideline, based on $TEE=1.3*mREE$; (ii) varying the estimates for TEE based on multiples of mREE. **Methods:** Indirect calorimetry was used to measure REE in 900 patients with cirrhosis (mean $[\pm 1SD]$ age 55.7 ± 11.6 yr; 70% men; 52% Asian descent). Daily energy intakes were calculated for individual patients according to each of the available guidelines viz *ESPEN 1997, 2006, and 2019; ISHEN 2013* and *EASL 2019*. The proportions of patients who, based on the individual recommended guidelines, met, exceeded or failed to meet their estimated daily energy requirements, based on a TEE of $1.3*mREE$, were determined. The effect of varying the estimates for TEE on the accuracy of the estimated daily energy requirements was explored using multiples of $1.1-1.5*mREE$ and the *ESPEN 1997* recommended daily energy intake of 25-35 kcal/kg. **Results:** If the *ESPEN 1997* recommended intakes were applied then 66% of patients would meet their estimated daily energy requirements. However, if the intakes recommended in the other guideline were applied then high proportion of the patients would exceed their estimated daily energy needs viz *ESPEN 2006*, 88%; *ESPEN 2019*, 64%; *EASL 2019*, 88% (BMI ≥ 30) and 79% (BMI >30); and *ISHEN 2013*, 82% (BMI <20), 90% (BMI 20-30) and 37% (BMI $>30-40$). Increasing the estimates for TEE based on mREE significantly increased the proportions of patients meeting their estimated daily energy requirements. Thus, using an estimated TEE of $mREE*1.35$ the provision of 25-35 kcal/kg dry body weight would adequately meet the daily requirements of 70.4% of patients with cirrhosis and exceed requirements in only 14%. **Conclusion:** If the guidelines for daily energy intakes are based on the currently recommended estimate for TEE then intakes would be overestimated for the majority of patients with cirrhosis. Guidelines need to be based on accurate assessments of TEE.

Table 1: Available guidelines relating to daily energy intakes in patients with cirrhosis

Guideline body	Recommendation for daily energy intake	Comment
ESPEN 1997	<p><i>Compensated cirrhosis</i></p> <ul style="list-style-type: none"> • Energy 1.3 x REE or 25-35 kcal/kg/day of non-protein energy <p><i>Complications</i></p> <ul style="list-style-type: none"> • Energy 35-40 kcal/kg/day 	Ideal body weight should be used for the calculation of requirements
ESPEN 2006	<ul style="list-style-type: none"> • Energy 35–40 kcal/kg body weight/day 	<p>No variation in the advice in relation to the severity of the liver disease or the nutritional status</p> <p>No prescription in relation to the measure of body weight to use</p>
ESPEN 2019	<p><i>Compensated cirrhosis</i></p> <ul style="list-style-type: none"> • Energy 1.3 x REE or 30-35 kcal/kg/day <p><i>Malnourished and muscle depleted</i></p> <ul style="list-style-type: none"> • Energy 30-35 kcal/kg/day <p>Increase energy intakes in the presence of acute complications, refractory ascites or malnutrition</p>	<p>Daily energy requirement in cirrhotic patients = 1.3 x measured REE</p> <p>In the absence of ascites, use actual body weight to calculate the basal metabolic rate; use the ideal weight according to body height in the presence of ascites</p> <p>Energy intake should not be increased in overweight or obese patients.</p>
ISHEN 2013	<p>Individual nutritional management advice based on BMI and nutritional status</p> <p><i>Normal weight/ overweight</i></p> <ul style="list-style-type: none"> • Energy 35-40 kcal/kg/day <p><i>Obese</i></p> <ul style="list-style-type: none"> • Energy 25-35 kcal/kg/day <p><i>Morbidly obese</i></p> <ul style="list-style-type: none"> • Energy 20-25 kcal/kg/day 	<p>Use estimated dry weight to calculate BMI in patients with fluid retention.</p> <p>Use ideal body weight for calculation of requirements.</p>
EASL 2019	<ul style="list-style-type: none"> • Energy at least 35 kcal/kg/day moderately hypocaloric (-500 to 800 kcal/d) diet in the obese cirrhotic patient 	<p>Use actual BW, corrected for ascites</p> <p>TEE in patients with cirrhosis varies between 28 to 37.5 kcal/kg/day</p>