



# Nutrition Priorities: Diet Recommendations in Liver Cirrhosis

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Prevention and management of malnutrition are essential to improve clinical outcomes for patients with cirrhosis. Depending on the population and assessment method of malnutrition, it is estimated that 50% to 90% of individuals with cirrhosis have malnutrition.<sup>1</sup> Individuals may struggle to meet calorie and protein requirements for a multitude of reasons, including but not limited to: increased nutrient requirements, reduced intake, malabsorption, and alterations in protein and glucose metabolism. Early nutrition education and aggressive nutrition interventions are imperative for preventing and halting progression of malnutrition in the population of patients with cirrhosis.

To prevent and treat malnutrition in patients with cirrhosis, clinicians need to prioritize nutrition care for the individual. Given the complexity of nutrition management, a registered dietitian should be involved in the care of these patients to complete a detailed nutrition assessment and intervention. Health literacy, socioeconomic status, social support, and alterations in mental status should all be considered when performing nutrition assessments and

providing diet education. Clinicians need to be flexible and concise in their recommendations so that patients understand exactly which nutrition goals to prioritize. In addition, nutrition priorities and goals may change as acuity of the patient's clinical status changes (i.e., decompensated in the hospital versus well-compensated at home). When discussing nutrition recommendations, total caloric intake and allocation of other macronutrients are important factors given the metabolic changes seen in those with cirrhosis.

## NUTRITION PRIORITY ONE: ADEQUATE CALORIC INTAKE

The first nutrition priority for the patient with cirrhosis is to promote overall adequate intake regardless of the macronutrient distribution (Fig. 1). Ensuring overall adequate intake decreases the duration of the fasting state in the body and in turn prevents muscle catabolism. Caloric recommendations for patients with cirrhosis are listed in Table 1.

Abbreviations: ASPEN, American Society of Parenteral and Enteral Nutrition; BCAA, branched-chain amino acid; ESPEN, European Society of Parenteral and Enteral Nutrition; REE, resting energy expenditure.

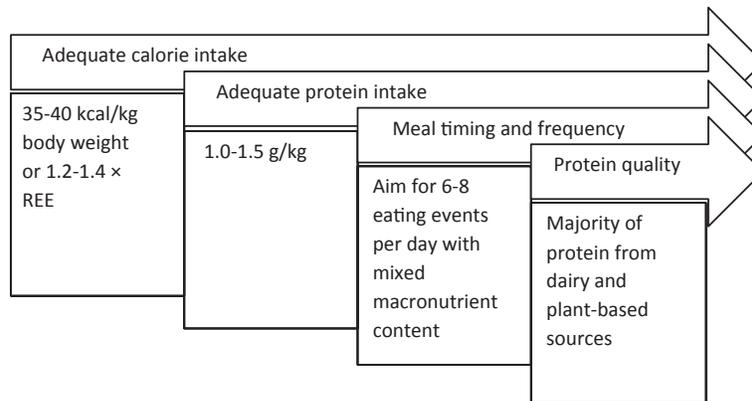
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Potential conflict of interest: Nothing to report.

Received March 28, 2019; accepted May 7, 2019.

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**FIG 1** Progression of nutrition provision priorities for the patient with cirrhosis.

**TABLE 1. NUTRITION REQUIREMENTS FOR END-STAGE LIVER DISEASE WITH CIRRHOSIS**

Energy requirements	
ESPEN <sup>2</sup>	35-40 kcal/kg/day
ASPEN <sup>3</sup>	1.2-1.4 × REE
Protein requirements	
ESPEN <sup>2</sup>	1.0-1.5 g/kg/day
ASPEN <sup>3</sup>	1.0-1.5 g/kg/day

### NUTRITION PRIORITY TWO: ADEQUATE PROTEIN INTAKE

After a patient is working toward improvements in overall caloric intake, then education can shift toward the second priority: protein intake. Ensuring the patient meets protein requirements is essential to conserving lean body mass. Protein requirements are recommended to be 1.0 to 1.5 g/kg dry body weight (Table 1).<sup>2,3</sup> Whereas protein restrictions were once implemented with the intent of preventing encephalopathy, this is not currently recommended. There are no clinical differences in severity of hepatic encephalopathy between patients receiving a low versus normal protein diet during hospital admission for acute hepatic encephalopathy exacerbation. Further, patients prescribed a protein restriction have an increase in the breakdown of skeletal muscle.<sup>4</sup> Patients with acute encephalopathy should be provided the appropriate medical management for their symptoms rather than restricting protein intake.<sup>3</sup>

### NUTRITION PRIORITY THREE: MEAL COMPOSITION AND TIMING

The third nutrition priority for patients with cirrhosis involves the ideal composition and frequency of meal and

**TABLE 2. EXAMPLE OF 1-DAY DIETARY INTAKE FOR AMBULATORY PATIENT WITH CIRRHOSIS**

Patient information	
Dry weight	80 kg
Nutrient requirements	2400-2800 kcal/day, 80-120 g/protein/day
Meals	
Breakfast	2 eggs, 1 slice sprouted grain toast with butter and jam
Snack	2 tablespoons peanut butter with apple, 8 oz soy milk
Lunch	Bean burrito (12-inch flour tortilla with 3/4 cup refried beans, 1/2 cup shredded cheddar cheese)
Snack	6 oz greek yogurt
Dinner	3 oz chicken breast, 3 medium asparagus spears, 1 cup cooked wild rice
Bedtime snack	1 cup ice cream
Nutrient totals	2400 kcal, 120 g protein

snack intake. Given changes in the liver’s ability to store glycogen, intake of carbohydrate in conjunction with protein ensures proper allocation of protein for muscle maintenance and rebuilding.<sup>5</sup> Having these mixed macronutrient meals and snacks at regular and frequent intervals throughout waking hours helps the patient meet nutritional needs and reduce the time the patient’s body is spent in a fasting state. Therefore, it is recommended that patients have a bedtime time snack containing carbohydrate and protein.<sup>5</sup> An example of meal composition and timing is provided in Table 2.

### NUTRITION PRIORITY FOUR: PROTEIN SOURCE

Once a patient is meeting the earlier nutrition recommendations, then a discussion regarding the source of protein may be the next step in optimizing nutrition care.

**TABLE 3. PROTEIN CONTENT OF SELECTED FOOD SOURCES**

Dairy	
Cow's milk (1 cup)	8 g
Greek yogurt (7 oz)	20 g
Cottage cheese (4 oz)	13 g
Cheese (1 oz)	7 g
Ice cream (1 cup)	4 g
Grain	
Lentils (1/2 cup cooked)	9 g
Sprouted grain bread (1 slice)	4 g
Quinoa (1/2 cup cooked)	4 g
Wild rice (1/2 cup cooked)	3.5 g
Vegetable	
Soy milk (1 cup)	8 g
Peas (1 cup)	8 g
Beans (1/2 cup)	7-10 g
Peanut butter (2 tablespoons)	8 g
Nuts (1 oz)	6 g
Pumpkin seeds (1 oz)	9 g
Almonds (1 oz)	6 g
Broccoli (1 cup)	2.5 g
Corn (1 cup)	4 g
Soy beans (edamame, 1/2 cup)	8.5 g
Asparagus (3 medium spears)	1.5 g
Brussel sprouts (1 cup)	3 g
Artichokes (1 medium)	4 g
Protein powder	
Whey (1 scoop)	25 g
Casein (1 scoop)	25 g
Pea (1 scoop)	25 g
Animal based	
Egg (1 large)	6 g
Chicken (1 oz)	7 g
Beef (1 oz)	7 g
Pork (1 oz)	7 g
Fish (1 oz)	7 g

Patients may benefit from a higher percentage of protein intake from plant-based and dairy-sourced protein (Table 3). One pathophysiological reason to support protein from plant-based and dairy sources is an increased intake of branched-chain amino acids (BCAAs) found within these foods.<sup>6,7</sup> Because of the changes in amino acid metabolism and insulin resistance in patients with cirrhosis, there is an imbalance of BCAAs available for protein synthesis in skeletal muscle.<sup>8</sup> Increased intake of BCAA intake may improve appetite, increase muscle synthesis, and have an impact in improving quality of life.<sup>7,9</sup> However, more randomized controlled studies comparing isonitrogenous (i.e., same total protein provision, but with composition from different food sources) interventions and their impact on outcomes are needed to provide more definitive recommendations. It should be noted that patients

should not be discouraged from consuming animal-based proteins, because it can be difficult to meet total protein needs without consumption of those foods. However, there is no harm and it is likely beneficial to encourage plant- and dairy-based protein sources to a patient.

Overall, aggressive and early nutrition care, ideally provided by a registered dietitian, as a part of the patient's overall medical management is crucial to improvement in clinical outcomes. Given the risk for and prevalence of malnutrition in this patient population, nutrition assessment and education should be done at regular intervals.

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