Breakthrough in Global Consensus for the Diagnosis of Malnutrition in Adults in Clinical Settings

Gordon L. Jensen, MD, PhD
Tommy Cederholm, MD, PhD

The Global Leadership Initiative on Malnutrition was convened by several of the major global clinical nutrition societies to build consensus on criteria for diagnosis of malnutrition (ie, undernutrition) for adults in clinical settings. The malnutrition criteria for consideration were identified from existing widely used approaches. They were then ranked by ballot among the Global Leadership Initiative on Malnutrition participants. There was strong endorsement of 3 phenotypic criteria (weight loss, low body mass index, and reduced muscle mass) and 2 etiologic criteria (reduced food intake or assimilation, and inflammation or disease burden). A consensus construct is proposed for the diagnosis of malnutrition that requires at least 1 phenotypic criterion and 1 etiologic criterion. Phenotypic metrics are suggested for severity grading. The etiologic criteria are intended to help guide interventions and anticipated outcomes. Going forward, our immediate priorities include promoting dissemination, implementation, validation studies, and feedback.
Nutr Today. 2019;54(2):58–63

Decreased intake or assimilation of nutrients will result in classic malnutrition, eg, undernutrition, but there is growing understanding that disease-associated inflammatory and other mechanisms may also contribute to malnutrition (ie, undernutrition).[1–3] Although malnutrition is a global concern associated with excess morbidity, mortality, and cost, there has been an unfortunate lack of consensus on diagnostic criteria for application in clinical settings. No single existing approach has gained widespread global acceptance,[1,4–8] making it difficult to compare findings across regions throughout the world or even between hospitals within regions. There is also misalignment of existing diagnosis coding protocols of the *International Classification of Diseases, 10th Revision* (http://www.who.int/classifications/icd/en/) with recent advances in clinical practice so that reimbursement denials for consultation are growing, and there is widespread confusion among practitioners. Therefore, it is an urgent priority to establish a global consensus regarding core criteria for the diagnosis of malnutrition in diverse clinical care settings. This article presents an overview of our recent consensus effort jointly published in the *Journal of Parenteral and Enteral Nutrition*[9] and *Clinical Nutrition*.[10] Please see the original articles for additional details and citations. For this consensus, our focus is on adults and malnutrition (ie, undernutrition). A similar process for children is a future priority.

CONSENSUS DEVELOPMENT

At the 2016 ASPEN meeting, the Global Leadership Initiative on Malnutrition (GLIM) was conceived to include a core leadership committee with 2 representatives from each of the participating global clinical nutrition societies: American Society for Parenteral and Enteral Nutrition (www.nutritioncare.org), European Society for Clinical Nutrition and Metabolism (ESPEN)(www.espen.org), Federacion Latinoamericana de Terapia Nutricional, Nutricion Clinica y Metabolis-mmo (FELANPE) (www.felanpeweb.org), and Parenteral and Enteral Nutrition Society of Asia (PENSA) (www.pensa-online.org) ([11]). An additional 27 participants were invited to comprise a larger supporting working group that brought additional global diversity and expertise to the consensus effort. There was agreement to develop a simple approach to malnutrition diagnosis using clinically relevant diagnostic criteria that are appropriate for application by all healthcare professionals.

Consensus was secured over the course of GLIM meetings held at the ESPEN and American Society for Parenteral and Enteral Nutrition meetings from 2016 to 2018.[9,10,12,13] There was strong consensus that the first step is malnutrition risk screening to identify "at risk" status by the use of any validated screening tool.[14–16] When "at risk" status

Gordon L. Jensen, MD, PhD, is senior associate dean for research and professor of medicine and nutrition, Larner College of Medicine, University of Vermont, Burlington.

Tommy Cederholm, MD, PhD, is professor, Department of Public Health and Caring Sciences, Clinical Nutrition and Metabolism, Uppsala University, and Theme Aging, Karolinska University Hospital, Stockholm, Sweden.

G.L.J. and T.C. are co–first authors of this article.

Correspondence: Gordon L. Jensen, MD, PhD, Office of the Dean, E-126 Given Bldg, 89 Beaumont Ave, Burlington, VT 05405 (Gordon.Jensen@med.uvm.edu).

DOI: 10.1097/NT.0000000000000327

is identified, then further assessment for diagnosis and severity grading should be conducted. A comprehensive survey of existing approaches used in screening and assessment of malnutrition was therefore performed (Table 1). A ballot was conducted whereby GLIM participants ranked criteria identified by the survey. An overwhelming majority of GLIM participants selected the following core criteria.

PHENOTYPIC CRITERIA

- **Weight Loss**

There was strong GLIM consensus for the inclusion of weight loss as a phenotypic criterion. Validity is well established.

- **Low Body Mass Index**

Because low body mass index (BMI) is not common among North American adults, it has not been widely adopted as a clinical malnutrition indicator in that region. However, much of the world currently makes use of BMI as a criterion, so this iteration of the GLIM consensus includes low BMI.

- **Reduced Muscle Mass**

Reduced muscle mass is a criterion with strong supporting evidence. The Global Leadership Initiative on Malnutrition recommends measurement using validated body composition measures such as dual-energy absorptiometry, bioelectrical impedance, ultrasound, computed tomography, or magnetic resonance imaging. Because these methods are still not widely available throughout the globe, physical

TABLE 1 Survey of Existing Approaches Used in Screening and Assessment of Malnutrition and Cachexia

	NRS[14] (2002)[a]	MNA-SF[17a,b]	MUST[18a]	ESPEN[8] (2015)[a]	ASPEN/ AND[7a]	SGA[4a]	Evans et al[5] (2008)[c]	PEW[18] (2008)[d]	Fearon[6] (2011)[c]
Etiologies									
Reduced food intake	X	X	X	X	X	X		X	X
Disease burden/ inflammation	X	X	X	X	X	X	X	X	X
Symptoms									
Anorexia		X				X	X		X
Weakness		X				X	X		
Signs/phenotype									
Weight loss	X	X	X	X	X	X	X	X	X
Body mass index	X	X	X	X			X	X	X
Lean/fat free/muscle mass		X		X	X	X	X	X	X
Fat mass					X	X		X	
Fluid retention/ascites					X	X			
Muscle function, eg, grip strength					X	X	X		
Biochemistry							X	X	

Abbreviations: AND, Academy of Nutrition and Dietetics; ASPEN, American Society of Parenteral and Enteral Nutrition; ESPEN, European Society for Clinical Nutrition and Metabolism; MNA-SF, Mini Nutritional Assessment—Short Form; MUST, Malnutrition Universal Screening Tool; NRS-2002, Nutritional Risk Screening—2002; PEW=Protein Energy Wasting, SGA, Subjective Global Assessment.

[a]Malnutrition approach.

[b]Adapted for older adults.

[c]Cachexia approach.

[d]Adapted for chronic kidney disease.

Table reprinted with permission from Wiley (Jensen et al[9]). Also reprinted with permission from Elsevier (Cederholm et al[10]).

examination or anthropometric measures of calf or arm muscle circumference are included as suitable alternatives. Assessment of muscle function using grip strength or other validated procedures is suggested as a supportive measure (Tables 2 and 3). However, such measures should be performed concurrently for the assessment of sarcopenia.[20]

ETIOLOGIC CRITERIA

- **Reduced Food Intake or Assimilation**

Reduced food intake or assimilation was selected by GLIM as a well-validated malnutrition criterion. Poor oral health, medication adverse effects, depression, gastrointestinal complaints, anorexia, and inadequate nutrition support are typical causes. Gastrointestinal disorders of malabsorption, motility, and obstruction are also associated with reduced assimilation of food/nutrients. Supportive indicators include gastrointestinal complaints such as dysphagia, nausea, vomiting, diarrhea, constipation, and abdominal pain.

- **Disease Burden/Inflammation**

Disease burden/inflammation is a widely accepted etiologic criterion for malnutrition that has been incorporated into the GLIM construct. Although severe inflammation is often easy to recognize, clinical judgment may be necessary to recognize that of lesser degree. Laboratory indicators such as serum C-reactive protein can serve as supportive proxy measures of inflammation.

APPROACH TO MALNUTRITION DIAGNOSIS, SEVERITY GRADING, AND CLASSIFICATION

The Global Leadership Initiative on Malnutrition consensus designates weight loss, reduced BMI, and reduced muscle mass as phenotypic criteria, and reduced food intake/assimilation and disease burden/inflammation as etiologic criteria (Table 2 and Figure). The Global Leadership Initiative on Malnutrition proposes that at least 1 phenotypic criterion and 1 etiologic criterion be required for malnutrition diagnosis. Review of existing approaches used in screening and assessment served to guide selection of threshold values for the consensus diagnostic criteria and for severity grading (Table 3). Although only the phenotypic criteria are used for severity grading, the inclusion of the etiologic criteria for malnutrition diagnosis helps to identify appropriate interventions and anticipated outcomes. An etiology-based diagnosis scheme consistent with other

TABLE 2 Phenotypic and Etiologic Criteria for the Diagnosis of Malnutrition

Phenotypic Criteria[a]			Etiologic Criteria[a]	
Weight Loss, %	Low Body Mass Index, kg/m^2	Reduced Muscle Mass[b]	Reduced Food Intake or Assimilation[c,d]	Inflammation[e,f,g]
>5 within past 6 mo, or >10 beyond 6 mo	<20 if <70 y, or <22 if >70 y Asia: <18.5 if <70 y, or <20 if >70 y	Reduced by validated body composition measuring techniques[b]	≤50% of ER >1 wk, or any reduction for >2 wk, or any chronic GI condition that adversely impacts food assimilation or absorption[c,d]	Acute disease/injury[e,g] or chronic disease related[f,g]

Abbreviations: ER, energy requirements; GI, gastrointestinal.

[a]Requires at least 1 phenotypic criterion and 1 etiologic criterion for diagnosis of malnutrition.

[b]For example, fat free mass index (kg/m^2) by dual-energy absorptiometry or corresponding standards using other body composition methods such as bioelectrical impedance analysis, computed tomography, or magnetic resonance imaging. When not available or by regional preference, physical examination or standard anthropometric measures such as mid-arm muscle or calf circumferences may be used. Thresholds for reduced muscle mass need to be adapted to race (Asia). Functional assessments such as hand-grip strength may be considered as a supportive measure.

[c]Consider gastrointestinal symptoms as supportive indicators that can impair food intake or absorption, for example, dysphagia, nausea, vomiting, diarrhea, constipation, or abdominal pain. Use clinical judgment to discern severity based on the degree to which intake or absorption is impaired. Symptom intensity, frequency, and duration should be noted.

[d]Reduced assimilation of food/nutrients is associated with malabsorptive disorders such as short bowel syndrome, pancreatic insufficiency, and after bariatric surgery. It is also associated with disorders such as esophageal strictures, gastroparesis, and intestinal pseudo-obstruction. Malabsorption is a clinical diagnosis manifesting as chronic diarrhea or steatorrhea. Malabsorption in those with ostomies is evidenced by elevated volumes of output. Use clinical judgment or additional evaluation to discern severity based upon frequency, duration, and quantitation of fecal fat and/or volume of losses.

[e]Acute disease/injury related. Severe inflammation is likely to be associated with major infection, burns, trauma, or closed head injury. Other acute disease/injury–related conditions are likely to be associated with mild to moderate inflammation.

[f]Chronic disease related. Severe inflammation is not generally associated with chronic disease conditions. Chronic or recurrent mild to moderate inflammation is likely to be associated with malignant disease, chronic obstructive pulmonary disease, congestive heart failure, chronic renal disease, or any disease with chronic or recurrent inflammation. Note that transient inflammation of a mild degree does not meet the threshold for this etiologic criterion.

[g]C-reactive protein may be used as a supportive laboratory measure.

Table reprinted with permission from Wiley (Jensen et al[9]). Also reprinted with permission from Elsevier (Cederholm et al[10]).

TABLE 3 Thresholds for Severity Grading of Malnutrition Into Stage 1 (Moderate) and Stage 2 (Severe) Malnutrition

Stage	Phenotypic Criteria[a]		
	Weight Loss, %	Low Body Mass Index,[b] kg/m^2	Reduced Muscle Mass[c]
Stage 1/moderate malnutrition (requires 1 phenotypic criterion that meets this grade)	5–10 within the past 6 mo, or 10–20 beyond 6 mo	<20 if <70 y, <22 if ≥70 y	Mild to moderate deficit (per validated assessment methods—see below)
Stage 2/severe malnutrition (requires 1 phenotypic criterion that meets this grade)	>10 within the past 6 mo, or >20 beyond 6 mo	<18.5 if <70 y, <20 if ≥70 y	Severe deficit (per validated assessment methods—see below)

[a]Severity grading is based upon the noted phenotypic criteria, while the etiologic criteria described in the text and the Figure 1 are used to provide the context to guide intervention and anticipated outcomes.

[b]Further research is needed to secure consensus reference body mass index data for Asian populations in clinical settings.

[c]For example, appendicular lean mass index (kg/m^2) by dual-energy absorptiometry or corresponding standards using other body composition methods such as bioelectrical impedance analysis, computed tomography, or magnetic resonance imaging. When not available or by regional preference, physical examination or standard anthropometric measures such as mid-arm muscle or calf circumferences may be used. Functional assessments such as hand-grip strength may be used as a supportive measure.

Table reprinted with permission from Wiley (Jensen et al[9]). Also reprinted with permission from Elsevier (Cederholm et al[10]).

recent guideline initiatives[1,2] is endorsed by GLIM. Diagnosis options include malnutrition related to chronic disease with inflammation, chronic disease with minimal or no perceived inflammation, acute disease or injury with severe inflammation, and starvation including hunger/food shortage associated with socioeconomic or environmental factors.

WHERE DO WE GO FROM HERE?

GLIM promotes adoption of global consensus criteria so that malnutrition prevalence, interventions, and outcomes may be evaluated across the globe. A universal "language" of malnutrition will support the development of global standards of care to promote improved outcomes. Strong consensus endorsed core phenotypic and etiologic criteria

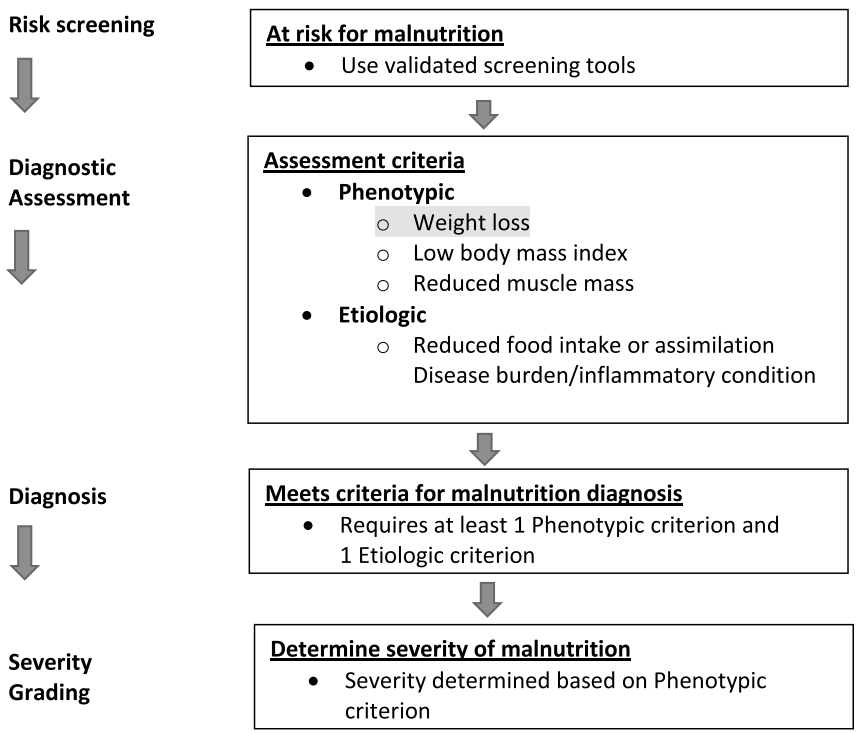

FIGURE 1. The Global Leadership Initiative on Malnutrition diagnostic scheme for screening, assessment, diagnosis and grading of malnutrition. Figure reprinted with permission from Wiley (Jensen et al[9]). Also reprinted with permission from Elsevier (Cederholm et al[10]).

for the diagnosis of malnutrition that are already in widespread use across the globe. Therefore, these criteria may be readily used with other approaches and additional criteria of regional preference. The consensus criteria were chosen for their simplicity and ready use by clinicians and other health practitioners using tools and methods that are generally available. The proposed approach is not intended to comprise comprehensive nutrition assessment, but it will provide a malnutrition diagnosis that may be complemented by more comprehensive assessments when individualized care and treatment plans are desired. Depending upon regional preferences and availability, it is recommended that consultation of skilled nutrition practitioners like dietitians be considered for comprehensive assessment.

The recommended GLIM approach encompasses both phenotypic and etiologic criteria for the diagnosis of malnutrition but uses only phenotypic criteria cut-points for severity grading. In order to better guide appropriate interventions and expected outcomes, etiology has been widely accepted as a diagnostic and guidance criterion by the clinical nutrition community ([1,8]). For example, the presence of a robust disease-associated inflammatory response will impact upon treatment selection and the outcome that may be anticipated. However, underlying etiology has not generally been included among criteria supporting the diagnosis of medical conditions in the ICD construct. The GLIM approach includes diagnostic criteria that address the spectrum of malnourished body morphologies - underweight, normal or obese. In healthcare settings it is increasingly common to confront malnutrition in overweight and obese persons that suffer undernutrition etiologies similar to their under or normal weight counterparts.

Optimal care requires appropriate malnutrition diagnosis and intervention, so we suggest that the GLIM consensus criteria should also be used to diagnose malnutrition in persons with overlap syndromes like sarcopenia, cachexia, and frailty. Since inflammatory mediators and other mechanisms besides malnutrition contribute to these overlap syndromes, it is also clear that approaches likely to benefit these syndromes will require additional interventions beyond nutrition, like pharmacological agents and exercise.

Going forward GLIM seeks to promote dissemination, implementation, validation testing, and feedback. Early testing will target existing databases with a longer-term goal of creating prospective databases across the globe comprised of the consensus core variables. It is anticipated that the consensus criteria will evolve through regular adaptations as new methodologies and evidence emerge. The Global Leadership Initiative on Malnutrition therefore proposes reevaluation every 3 to 5 years. In relation to the *International Classification of Diseases* revision process (*ICD-11*), GLIM will also share the proposed consensus approach with the World Health Organization. This is a particularly high priority because this classification scheme guides clinical diagnosis and reimbursement across the globe.

REFERENCES

1. Jensen GL, Mirtallo J, Compher C, et al. Adult starvation and disease-related malnutrition: a proposal for etiology-based diagnosis in the clinical practice setting from the International Consensus Guideline Committee. *JPEN J Parenter Enteral Nutr*. 2010;34(2):156–159. *Clin Nutr* 2010;29:151–153.
2. Cederholm T, Barazzoni R, Austin P, et al. ESPEN guidelines on definitions and terminology of clinical nutrition. *Clin Nutr*. 2017;36:49–64.
3. Soeters PB, Reijven PL, van Bokhorst-de van der Schueren MA, et al. A rational approach to nutritional assessment. *Clin Nutr*. 2008;27(5):706–716.
4. Detsky AS, McLaughlin JR, Baker JP, et al. What is subjective global assessment of nutritional status? *JPEN J Parenter Enteral Nutr*. 1987;11(1):8–13.
5. Evans WJ, Morley JE, Argilés J, et al. Cachexia: a new definition. *Clin Nutr*. 2008;27:793–799.
6. Fearon K, Strasser F, Anker SD, et al. Definition and classification of cancer cachexia: an international consensus. *Lancet Oncol*. 2011;12:489–495.
7. White JV, Guenter P, Jensen G, Malone A, Schofield M, Academy of Nutrition and Dietetics Malnutrition Work Group; A.S.P.E.N. Malnutrition Task Force; A.S.P.E.N. Board of Directors. Consensus statement of the Academy of Nutrition and Dietetics/American Society for Parenteral and Enteral Nutrition: characteristics recommended for the identification and documentation of adult malnutrition (undernutrition) (published correction appears in *J Acad Nutr Diet* 2012;112(11):1899 and copublished in *JPEN J Parenter Enteral Nutr* 2012;36(3):275–283). *J Acad Nutr Diet*. 2012;112(5):730–738.
8. Cederholm T, Bosaeus I, Barazzoni R, et al. Diagnostic criteria for malnutrition—an ESPEN consensus statement. *Clin Nutr*. 2015;34:335–340.
9. Jensen GL, Cederholm T, Correia MITD, et al. GLIM criteria for the diagnosis of malnutrition: a consensus report from the global clinical nutrition community. *JPEN J Parenter Enteral Nutr*. 2019;43(1):32–40.
10. Cederholm T, Jensen GL, Correia MITD, et al. GLIM criteria for the diagnosis of malnutrition—a consensus report from the global clinical nutrition community (published online ahead of print September 3, 2018). *Clin Nutr*. 2018.
11. Jensen GL. Global leadership conversation: addressing malnutrition. *JPEN J Parenter Enteral Nutr*. 2016;40(4):455–457.
12. Cederholm T, Jensen GL. To create a consensus on malnutrition diagnostic criteria: a report from the Global Leadership Initiative on Malnutrition (GLIM) meeting at the ESPEN Congress 2016. *Clin Nutr*. 2017;36:7–10.
13. Jensen GL, Cederholm T. Global Leadership Initiative on Malnutrition: progress report from ASPEN Clinical Nutrition Week 2017 (published online ahead of print April 1, 2017). *JPEN J Parenter Enteral Nutr*. 2017.
14. Kondrup J, Allison SP, Elia M, Vellas B, Plauth M, Educational and Clinical Practice Committee, European Society of Parenteral and Enteral Nutrition (ESPEN). ESPEN guidelines for nutrition screening 2002. *Clin Nutr*. 2003;22(4):415–421.
15. Skipper A, Ferguson M, Thompson K, Castellanos VH, Porcari J. Nutrition screening tools: an analysis of the evidence. *JPEN J Parenter Enteral Nutr*. 2012;36(3):292–298.
16. Van Bokhorst-de van der Schueren MA, Guaitoli PR, Jansma EP, de Vet HC. Nutrition screening tools: does one size fit all? A systematic review of screening tools for the hospital setting. *Clin Nutr*. 2014;33(1):39–58.
17. Rubenstein LZ, Harker JO, Salvà A, Guigoz Y, Vellas B. Screening for undernutrition in geriatric practice: developing the short-form mini-nutritional assessment (MNA-SF). *J Gerontol A Biol Sci Med Sci*. 2001;56:M366–M372.

18. Stratton RJ, Hackston A, Longmore D, et al. Malnutrition in hospital outpatients and inpatients: prevalence, concurrent validity and ease of use of the 'malnutrition universal screening tool' ('MUST') for adults. *Br J Nutr*. 2004;92:799–808.
19. Fouque D, Kalantar-Zadeh K, Kopple J, et al. A proposed nomenclature and diagnostic criteria for protein-energy wasting in acute and chronic kidney disease. *Kidney Int*. 2008;73:391–398.
20. Cruz-Jentoft AJ, Bahat G, Bauer J, et al. Sarcopenia: revised European consensus on definition and diagnosis. *Age Ageing*. 2019;48(1):16–31.

Instructions:

- Read the article on page 58.
- The test for this CE activity must be taken online. Tests can not be mailed or faxed.
- You will need to create (its free!) and login to your personal CE Planner account before taking online tests. Your planner will keep track of all your Lippincott Professional Development online CE activities for you.
- There is only one correct answer for each question. A passing score for this test is 13 correct answers. If you pass, you can print your certificate of earned contact hours and access the answer key. If you fail, you have the option of taking the test again at no additional cost.
- For questions, contact Lippincott Professional Development: 1-800-787-8985.

Registration Deadline: March 5, 2021

Continuing Education Information for Registered Dieticians and Dietetic Technicians, Registered:

The test for this activity for dietetic professionals is located online at http://alliedhealth.ceconnection.com. Lippincott Professional Development (LPD) is a Continuing Professional Education (CPE) Accredited Provider with the Commission on Dietetic Registration (CDR), provider number LI001. Registered dietitians (RDs) and Dietetic Technicians, Registered (DTRs) will receive 1.0 continuing professional education units (CPEUs) for successful completion of this program/material, CPE Level 2. Dietetics practitioners may submit evaluations of the quality of programs/materials on the CDR website: www.cdrnet.org. LPD is approved as a provider of continuing education for the Florida Council for Dietetics and Nutrition, CE Broker #50-1223.

Continuing Education Information for Nurses:

Lippincott Professional Development will award 1.5 contact hours for this continuing nursing education activity.

The test for this activity for nurses is located at https://nursing.ceconnection.com.

Lippincott Professional Development is accredited as a provider of continuing nursing education by the American Nurses Credentialing Center's Commission on Accreditation.

This activity is also provider approved by the California Board of Registered Nursing, Provider Number CEP 11749 for 1.5 contact hours. Lippincott Professional Development is also an approved provider of continuing nursing education by the District of Columbia, Georgia, and Florida CE Broker #50-1223.

Disclosure Statement:

The planners have disclosed no financial relationships related to this article.

Payment:

- The registration fee for this test is $12.95.