

Enhance Your Clinical Skills with Nutrition Focused Physical Exam

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Disclosures

- Employed by the National Kidney Foundation of Illinois
- Stipend position with the Renal Dietitians Dietetic Practice Group
- Board member of the Council on Renal Nutrition
- Owner of Kidney Nutrition Specialists
- National media spokesperson for the Academy of Nutrition and Dietetics

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Objectives

- Define malnutrition.
- Discuss the influence of inflammation on nutritional status.
- Review the four parts of the Nutrition Care Process.
- List the components of a nutrition focused physical examination.
- Demonstrate how to perform a nutrition focused physical examination.

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Malnutrition

ASPEN, GLIM, Screening Tools

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Malnutrition Defined

- “any nutritional imbalance”
- Encompasses both under and over-nutrition
- Focus: Often undernutrition
- Yet even the overweight or obese individual can be at risk for or experience
- Malnutrition occurs in both underweight and overweight individuals

White JV, Guenter P, Jensen G, Malone A, Schofield M. 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). *Journal of the Academy of Nutrition and Dietetics*. 2012;112(5):730-737.

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Incidence & Impact of Malnutrition

- 20-50% of all hospitalized patients are malnourished¹
- Associated with increased:²
 - LOS
 - Complications
 - Hospital costs
 - Readmission rates³
 - Morbidity
 - Mortality

1. ASPEN. American Society for Parenteral and Enteral Nutrition. Malnutrition Matters Education Program for Providers. <http://www.nutritioncare.org/malnutritionmatters/>. Accessed 3/20/2022.

2. de van der Schueren M, Elia M, Gramlich L, et al. Clinical and economic outcomes of nutrition interventions across the continuum of care. *Annals of the New York Academy of Sciences*. 2014;1321:20-40. <http://onlinelibrary.wiley.com/doi/10.1111/nyas.12358/full>. Accessed 3/20/2022.

3. MQI. Malnutrition Quality Improvement Initiative. Why Malnutrition Matters. <http://malnutritionquality.org/why-malnutrition-matters.html>. Accessed 3/20/2022.

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Positive Impact of Identifying the Malnourished Patient & Intervening

Decreased:

- LOS
- Complications
- Hospital costs
- Readmission rate
- Morbidity
- Mortality

Improved:

- QOL

Additional Benefits:

- RD value

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Abbreviated Timeline

1996: Joint Commission required nutrition screening within 24 hours of admission

2007: CMS* modified its prospective payment system (DRGs*) into a hierarchical system named the MS-DRGs*

- Indicated presence or absence of complications or comorbidities
- Linked to a fixed payment.
- Identified malnutrition as a MS-DRG

2009: ASPEN & ESPEN developed the malnutrition diagnosis etiology

2009: AND & ASPEN developed the malnutrition clinical characteristics

2010 & 2011: NCHS asked AND & ASPEN for information on the malnutrition codes

2014: Alliance to Advance Patient Nutrition was formed

2015: Joint Commission reported addressing malnutrition in hospitalized patients is a national goal

*CMS: Center for Medicare and Medicaid Services, DRGs: Diagnostic Related Groups, MS-DRGs: Medicare Severity Diagnostic Related Groups, NCHS: National Center for Health Statistics

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Etiology of Malnutrition

1. Social / Environmental Circumstances

- Chronic starvation *without* inflammation
- Pure, chronic starvation or disordered eating such as anorexia nervosa

2. Acute Illness or Injury

- Occurs < 3 months
- Severe inflammation
- Major infections, burns, trauma, closed head injury

3. Chronic Illness

- Occurs ≥ 3 months
- Mild to moderate inflammation
- Organ failure, pancreatic cancer, rheumatoid arthritis

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Characteristics of Malnutrition

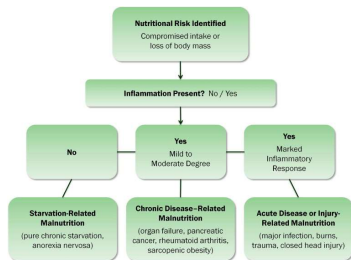
Malnutrition is diagnosed when any 2 or more of the following are present:

- Insufficient energy intake
- Weight loss
- Loss of muscle mass
- Loss of subcutaneous fat
- Localized or generalized fluid accumulation that may sometimes mask weight loss
- Diminished functional status as measured by hand grip strength

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Inflammation

- **Definition:** a local response to cellular injury that is marked by capillary dilatation, leukocytic infiltration, redness, heat, and pain and that serves as a mechanism initiating the elimination of noxious agents and of damaged tissue¹; protective response.¹
- **Signs:** fever, hypothermia, tachycardia, hyperglycemia, elevated CRP, elevated WBC^{2,3}
- **Causes a reprioritization of proteins synthesized:**
 - **Negative acute phase protein synthesis is decreased:** albumin, prealbumin, transferrin, and retinol binding protein
 - **Positive acute phase protein synthesis is increased:** antibodies, complement proteins, C-reactive protein, coagulation proteins, and transport proteins

1. Merriam Webster: <http://www.merriam-webster.com/dictionary/inflammation>

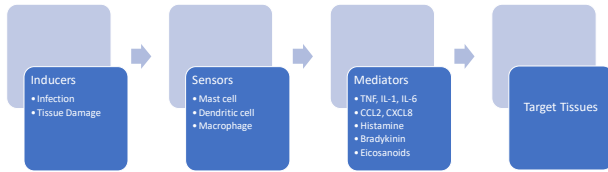
2. White JV, Guenter P, Jensen G, Malone A, Schofield M. Consensus Statement of the Academy of Nutrition and Dietetics/American Society for Parenteral and Enteral Nutrition: Characteristics Recommended for the Identification and Documentation of Adult Malnutrition (Undernutrition)

3. Jensen G, Hsiao P, Wheeler D. Adult Nutrition assessment Tutorial. *JPEN* 2012;36(3):267-274. <http://jpen.sagepub.com/content/36/3/267.abstract>. Accessed 3/15/2022.

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Inflammation Pathway



Lon H et al. Crit Rev Biomed Eng. 2012;40(4):299-312.

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Acute vs Chronic Inflammation

Acute

- Short time course
- Nonspecific immune response
- Stereotyped response
- Fluid production
- Vascular response
- Cells are neutrophils and basophils
- Occasionally necrosis

Chronic

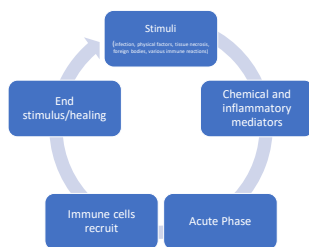
- Longer time course
- Specific immune response
- Response variable
- Production of fibrous tissue
- Cells are mainly macrophages and fibroblasts
- Always necrosis

Anushevan P. Oxid Med Cell Longev. 2016;2016:5276130.

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Acute Inflammation



Anushevan P. Oxid Med Cell Longev. 2016;2016:5276130.

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Inflammatory Mediators and Responses

- | | | |
|--|--|--|
| 01 Vasodilation
Prostaglandins (PGI_2 , PGE_2 , PGE_3 , PGD_2),
Nitric oxide (NO) | 02 Increased Vascular Permeability
Histamine
Complement components (C3a , C5a)
Bradykinin
Leukotrienes (LTC_4 , LTD_4 , LTE_4),
Platelet-activating factor
Substance P
Calcitonin gene-related peptide (CGRP) | 03 Chemotaxis and Leukocyte Activation
C5a
LTB_4
Lipoteins (LXA_4 , LXB_4)
Bacterial products |
| 04 Tissue Damage
Neutrophil
Macrophage
Lysosomal products
Oxygen radicals
NO | 05 Fever
Interleukin-1 (IL-1)
IL-6T
Tumor necrosis factor (TNF)
LTD_4
LXA_4 and LXB_4 | 06 Pain
PGE_2 and PGI_2
Bradykinin
CGRP |

Lon H et al. Crit Rev Biomed Eng. 2012;40(4):295-312.

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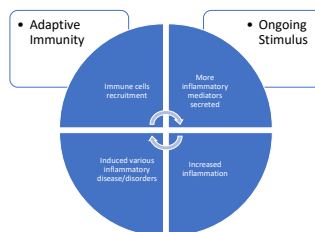
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Chronic Inflammation



Anushevan P. Oxid Med Cell Longev. 2016;2016:5276130.

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Free Radicals

- “A free radical is a molecule or atom that carries one or more unpaired electrons and is able to exist independently.”
 - Odd number of electrons
 - Short-lived
 - Highly reactive
 - Unstable
 - Reacts quickly to “catch” electron to obtain stability
 - Attacked molecule can become a free radical by losing its electron and starting a chain reaction causing damage to the living cell

Arubelvan P. Oxid Med Cell Longev. 2016;2016:5276130.

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Free Radicals and Their Reactivity

Free Radical	Reactivity
Superoxide anion	Generated in mitochondria, cardiovascular system, and other cell types
Hydrogen peroxide	Formed in the human body by many reactions and yields potent reactive species
Hydroxyl radical	Highly reactive and generated during iron overload and such conditions in the human body
Peroxyl radical	Reactive and formed from lipids, proteins, DNA, and sugar molecules during oxidative damage
Nitric oxide	Neurotransmitter and blood pressure regulation and can yield potent oxidants during pathological states
Peroxynitrite	Highly reactive and formed from NO and superoxide
Ozone	Present as an atmospheric pollutant and can react with various molecules

Arubelvan P. Oxid Med Cell Longev. 2016;2016:5276130.

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Reactive Oxygen Species

- Reactive oxygen species (ROS) are derivatives such as singlet oxygen and hydrogen peroxide
- Produced during normal cellular metabolism
- Play a role in activation of signaling pathways in animal and plant cells
- Produced in cells through mitochondrial respiratory chain

Arubelvan P. Oxid Med Cell Longev. 2016;2016:5276130.

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Inflammation

Negative Acute Phase Reactants	Positive Acute Phase Reactants
↓ Albumin	↑ CRP
↓ Transferrin	↑ Ferritin
↓ Cholesterol	↑ Proinflammatory cytokines (i.e. interleukin-6)
↓ Pre-Albumin	

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Laboratory Value	Nutrition Independent Factors	Half-Life	Appropriateness to Detect Malnutrition	Appropriateness to Monitor Nutritional Therapy
Albumin	↓ dehydration ↓ inflammation, infections, trauma, heart failure, edema, liver dysfunction, nephrotic syndrome	20 d	+ / ++ Not appropriate in case of anorexia and acute illness	Not appropriate due to high susceptibility and long half-life
Transferrin	↑ renal failure, iron status, acute hepatitis, hypoxia ↓ inflammation, chronic infections, hemochromatosis, nephrotic syndrome, liver dysfunction	10 d	+	+
Prealbumin/Transferrin (TTR)	↑ renal dysfunction, dehydration, corticosteroid therapy ↓ inflammation, hyperthyroidism, liver disease, overhydration	2 d	++	++ / +++
Retinol binding protein (RBP)	↑ kidney failure, alcohol abuse ↓ hyperthyroidism, chronic liver diseases, vitamin A deficiency, selenium deficiency	12 h	Idem prealbumin	Idem prealbumin
Insulin-like growth factor 1 (IGF-1)	↑ kidney failure ↓ liver diseases, severe catabolic status, age	24 h	++	+++ More specific than retinol-binding protein and prealbumin/transferrin
Urinary creatinine	↑ collection time > 24h, infection, trauma ↓ insufficient collection time, acute kidney failure	-	↑ amount of creatinine is derived from 1.9 kg of skeletal muscle mass	Not appropriate, very slow
Lymphocytes	↑ healing phase after infection, hematologic diseases ↓ sepsis, hematologic disease, immune suppressants, steroids	-	+	Not appropriate, very slow

Reber E et al. J. Clin. Med. 2019; 8, 1065.

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Test Your Knowledge

- Acute inflammation typically involved an immune response whereas chronic inflammation has no immune response
 - True
 - False

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Test Your Knowledge

- When a person has inflammation c-reactive protein are ferritin are
 - Lower than reference range
 - Within the reference range
 - Above the reference range**

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Context	Acute Illness or Injury		Chronic Illness		Social or Environmental	
Degree of Malnutrition	Non-severe (Moderate)	Severe	Non-severe (Moderate)	Severe	Non-severe (Moderate)	Severe
Energy intake	<75% of estimated energy intake requirement for > 7 days	<50% of estimated energy intake requirement for > 5 days	<75% of estimated energy intake requirement for > 1 month	<50% of estimated energy intake requirement for > 1 month	<75% of estimated energy intake requirement for > 3 months	<50% of estimated energy intake requirement for > 1 month
Weight Loss	1-2% 1 wk 5% 1 mo 7.5% 3 mos	>2% 1 wk >5% 1 mo >7.5% 3 mos	5% 1 mo 7.5% 3 mos 10% 6 mos 20% 1 y	>5% 1 mo >7.5% 3 mos >10% 6 mos >20% 1 y	5% 1 mo 7.5% 3 mos 10% 6 mos 20% 1 y	>5% 1 mo >7.5% 3 mos >10% 6 mos >20% 1 y
Body Fat	Mild	Moderate	Mild	Severe	Mild	Severe
Muscle Mass	Mild	Moderate	Mild	Severe	Mild	Severe
Fluid Accumulation	Mild	Moderate to Severe	Mild	Severe (11-60), (3-4+)	Mild	Severe (11-60), (3-4+)
Reduced Grip Strength	n/a	Measurably Reduced <i>Not rec. in ICU</i>	n/a	Measurably Reduced	n/a	Measurably Reduced

1. White N, Guetter S, Jensen R, Malhotra A, Schofield W. Consensus Statement of the Academy of Nutrition and Dietetics/European Society for Parenteral and Enteral Nutrition: Characteristics Recommended for the Identification and Documentation of Adult Malnutrition (Undernutrition). *Journal of the Academy of Nutrition and Dietetics*. 2012;112(5):790-797.

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Malnutrition Diagnosis and Documentation: Strategies for Success

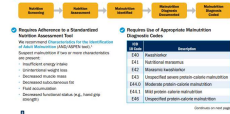
Diagnosis and documentation of malnutrition are complex tasks that require a multidisciplinary approach. This document provides a framework for successful diagnosis and documentation of malnutrition.

Diagnosis and Documentation: Key Concepts

Requires a Multidisciplinary Approach



Requires a Standardized Nutrition Data Protocol



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Malnutrition Diagnosis and Documentation: Strategies for Success

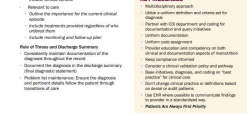
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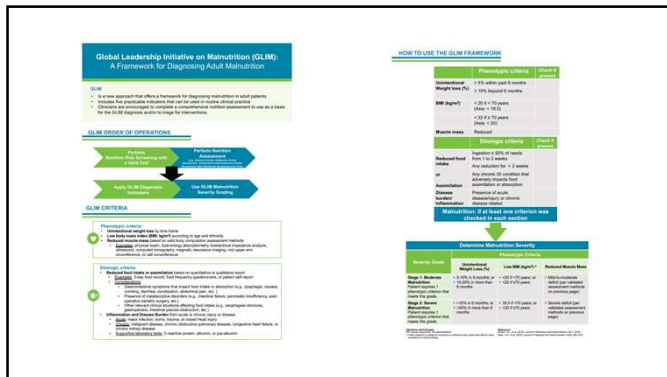


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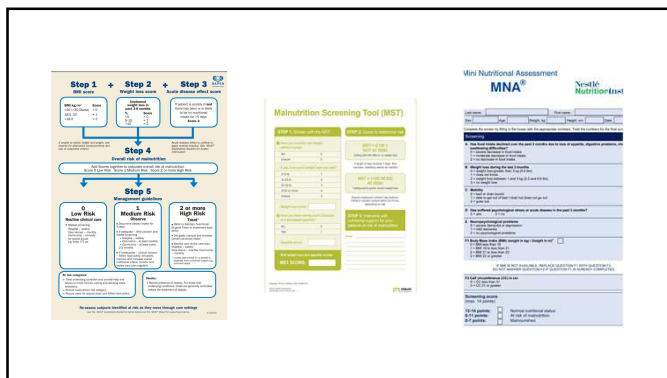


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[illegible]

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Geriatric Nutrition Risk Index

The GNRI index is a modification of the NRI (Nutritional Risk Index) in which the value of "normal weight patients" replaces the original formula of "ideal weight patients" to be applied in the geriatric population.

$$GRNI = 1.519 \times \text{Albumin (g/l)} + 41.7 \times \frac{\text{current weight (kg)}}{\text{ideal weight (kg)}}$$

This index considers two main parameters: serum albumin and the ratio between the current weight and ideal weight of the individual.

GNRI formula is structured to give greater weight to plasma albumin than to patients' weight and cut-off points are used to predict health problems in the subsequent months.

GNRI is not an index of malnutrition, it is a "nutrition related" risk index because GNRI scores are correlated to a severity score that considers nutrition status-related complications such as bedsores and infections.

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Put it into Practice

- Patient Scenario
 - 64-year-old female with a history of CKD on dialysis 3 x /week, hypertension, and anemia.
 - Weight: 59 kg, Usual body weight: 68 kg, Height: 172.72 m, BMI: 19.73
 - Weight Loss: 13% in 3 months, unplanned
 - Labs: C-reactive protein 15 mg/L (high), Albumin 3.6 mg/dL, Ferritin 1200 mcg/L (high), White blood cells 8,500, Cholesterol 99 (mmol/L)
 - Reported appetite fair, consuming about 60% of most meals
 - Reported taste changes and food not tasting "right" for more than 2 weeks
 - Has family support at home to help with meal preparation and grocery shopping
 - Physical findings: lower extremity edema, temporal wasting, bony projections of knee, shoulders, clavicle.

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Poll

- Is this patient at nutrition risk?
 - Yes
 - No

32

Poll

- Does this patient have inflammation?
 - Yes
 - No

33

Poll

- Is this patient malnourished?
 - **Yes, moderate malnourished**
 - Yes, severe malnourished
 - No, well-nourished

34

Poll

- Based on screening the best practice for this patient is to:
 - Provide routine clinical practice
 - Observe and rescreen in 3 months
 - **Treat for malnutrition and begin a care plan**

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Put it into Practice

- Patient Scenario
 - 37-year-old male with a history of polycystic kidney disease, high blood pressure.
 - Weight: 80 kg, Usual body weight: 85 kg, Height: 182.88 m, BMI: 23.86
 - Weight Loss: 5% in 3 months, unplanned
 - Labs: C-reactive protein 8 mg/L (high), Albumin 3.9 mg/dL, Ferritin 200 mcg/L, Hemoglobin 12 g/dL
 - Reported appetite good, consuming about 90 - 100% of most meals
 - Works full time, cooks for self
 - Physical findings: good muscle and fat stores.

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Poll

- Is this patient at nutrition risk?
 - Yes
 - No

37

Poll

- Does this patient have inflammation?
 - Yes
 - No

38

Poll

- Is this patient malnourished?
 - Yes, moderately malnourished
 - Yes, severely malnourished
 - No, well-nourished

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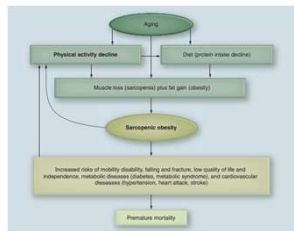
Poll

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Sarcopenic Obesity

Sarcopenic obesity is the combination of low muscle mass plus high fat mass based on the body composition phenotypes. However, modern definition of sarcopenia includes low muscle strength (weak handgrip strength) and poor physical function (slow walking).



Duck-chul L. et al. Future Sci. OA, 2016.

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Table 1. Clinical definition of sarcopenia					Ref.
Group	Physical function	Diagnostic criteria and cut-points for sarcopenia	Muscle mass		
European Working Group on Sarcopenia in Older People (EWG-SOP, 2010)	Gait speed <0.8 m/s	Handgrip strength	DXA ALM/height ²	(3)	
		Men: <20 kg Women: <16 kg	Men: <7.23 kg/m ² Women: <5.67 kg/m ² BIA SMM/height ² Men: <8.87 kg/m ² Women: <6.42 kg/m ² Men: <15.76 kg/m ² Women: <8.76 kg/m ²		
International Working Group on Sarcopenia (IWG, 2011)	Gait speed <1.0 m/s		DXA ALM/height ²	(3)	
			Men: <7.23 kg/m ² Women: <5.67 kg/m ²		
Asian Working Group for Sarcopenia (AWG, 2016)	Gait speed <0.8 m/s	Handgrip strength	DXA ALM/height ²	(3)	
		Men: <20 kg Women: <18 kg	Men: <7.5 kg/m ² Women: <5.4 kg/m ² BIA ALM/height ² Men: <15.5 kg/m ² Women: <5.7 kg/m ²		
Foundation for the NIH Sarcopenia Project (FNIHSP, 2014)	Gait speed <0.8 m/s	Handgrip strength	DXA ALM/BMI	(3)	
		Men: <20 kg Women: <16 kg	Men: <0.200 Women: <0.512		

Physical function was measured based on total body gait speed. Muscle mass was measured by DEXA or BIA. The cut-points were derived based on total body gait speed. Muscle mass was measured by DEXA or BIA. The cut-points were derived based on gait speed and muscle mass. BIA: Bioelectrical Impedance Analysis; DEXA: Dual-energy X-ray absorptiometry; SMM: skeletal muscle mass; ALM: appendicular lean mass; BMI: body mass index; BIA: bioelectrical impedance analysis; DEXA: dual-energy X-ray absorptiometry; SMM: skeletal muscle mass; ALM: appendicular lean mass.

Duck-chul L. et al. Future Sci. OA, 2016.

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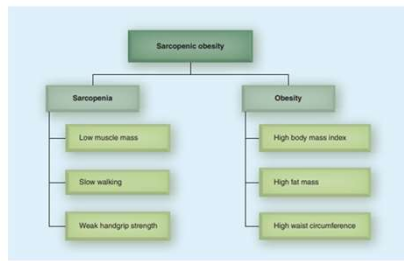
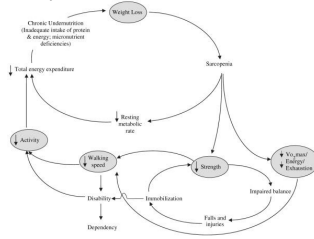


Figure 2. Diagnostic criteria for sarcopenic obesity.

Duck-chul L et al. Future Sci. OA. 2016.

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Cycle of Frailty



Xue Q. Clin Geriatr Med. 2011;27(1):1-15.

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Notes

Handgrip strength

Handgrip strength is the force generated by the hand and forearm muscles. It is a measure of muscle mass and strength. Handgrip strength is measured using a handgrip dynamometer. The dynamometer is held in the dominant hand, and the subject is asked to squeeze the handle as hard as possible. The maximum value is recorded. Handgrip strength is a good indicator of overall health and is associated with mortality. Low handgrip strength is associated with increased risk of disability and death.

Measurement

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Interpretation

Handgrip strength is a measure of muscle mass and strength. It is a good indicator of overall health and is associated with mortality. Low handgrip strength is associated with increased risk of disability and death.

Reference values

Age Gender Handgrip strength (kg)

18-29	Male	40
18-29	Female	30
30-39	Male	45
30-39	Female	35
40-49	Male	50
40-49	Female	40
50-59	Male	55
50-59	Female	45
60-69	Male	60
60-69	Female	50
70-79	Male	65
70-79	Female	55
80-89	Male	70
80-89	Female	60
90-99	Male	75
90-99	Female	65

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90-99	Male	75
90-99	Female	65

Handgrip strength is the force generated by the hand and forearm muscles. It is a measure of muscle mass and strength. Handgrip strength is measured using a handgrip dynamometer. The dynamometer is held in the dominant hand, and the subject is asked to squeeze the handle as hard as possible. The maximum value is recorded. Handgrip strength is a good indicator of overall health and is associated with mortality. Low handgrip strength is associated with increased risk of disability and death.

Measurement

Handgrip strength is measured using a handgrip dynamometer. The dynamometer is held in the dominant hand, and the subject is asked to squeeze the handle as hard as possible. The maximum value is recorded. Handgrip strength is a good indicator of overall health and is associated with mortality. Low handgrip strength is associated with increased risk of disability and death.

Interpretation

Handgrip strength is a measure of muscle mass and strength. It is a good indicator of overall health and is associated with mortality. Low handgrip strength is associated with increased risk of disability and death.

Reference values

Age Gender Handgrip strength (kg)

18-29	Male	40
18-29	Female	30
30-39	Male	45
30-39	Female	35
40-49	Male	50
40-49	Female	40
50-59	Male	55
50-59	Female	45
60-69	Male	60
60-69	Female	50
70-79	Male	65
70-79	Female	55
80-89	Male	70
80-89	Female	60
90-99	Male	75
90-99	Female	65

Fried L et al. The Journals of Gerontology: Series A. 2001;56(3):M348-M357.

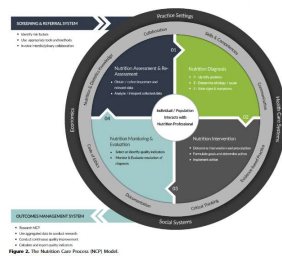
45

The Nutrition Care Process

Assessment, Diagnosis, Intervention, Monitoring/Evaluation

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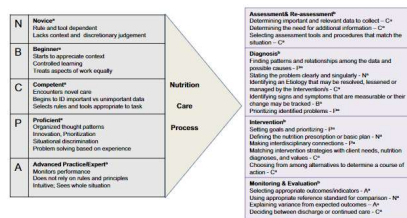
THE NUTRITION CARE PROCESS MODEL



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Acquisition of Nutrition Care Process (NCP) critical thinking.



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48

Nutrition Assessment

- Systematic approach to collect, classify, and synthesize information to determine nutrition-related problems and causes
- Five Domains
 - Food/Nutrition-Related History
 - Anthropometric Measures
 - Biochemical, Medical Data
 - Nutrition-Focused Physical Findings
 - Client History

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Nutrition Diagnosis

- Identification and labeling of an existing nutrition problem(s) that the practitioner is responsible for treating.
- Three domains
 - Intake
 - Clinical
 - Behavioral-Environmental

50

Nutrition Diagnosis

- (P)roblem – can the nutrition problem be resolved?
- (E)tiology – root cause that can be addressed with nutrition intervention?
- (S)igns/Symptoms – specific enough to be able to monitor?

Inadequate oral intake related to taste changes from chemotherapy as evidenced by consuming less than 50% of estimated needs on diet recall.

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Nutrition Intervention

- Purposefully planned action(s) designed with the intent of changing a nutrition-related behavior, risk factor, environmental condition, or aspect of health status to resolve or improve the identified nutrition diagnosis(es) or nutrition problem(s).
- Resolve the nutrition diagnosis by altering or eliminating the nutrition etiology.

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Nutrition Intervention

- Five domains
 - Food and/or nutrient delivery
 - Nutrition education
 - Nutrition counseling
 - Coordination of nutrition care
 - Population based nutrition action

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Nutrition Monitoring and Evaluation

- To determine and measure the amount of progress made for the nutrition intervention and if expected outcomes are being met.
- Four domains
 - Food/Nutrition-Related History Outcomes
 - Anthropometric Measurement Outcomes
 - Biochemical Data, Medical Tests, and Procedure Outcomes
 - Nutrition-Focused Physical Finding Outcomes

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Monitoring and Evaluation

Nutrition monitoring and evaluation identifies outcomes relevant to the nutrition diagnosis and intervention plans and goals. Data sources and tools for Nutrition Monitoring and Evaluation include the following:

- Self-monitoring data or data from other records including forms, spreadsheets, and computer programs
- Anthropometric measurements, biochemical data, medical tests, and procedures
- Patient/client surveys, pretests, posttests and/or questionnaires
- Mail or telephone follow-up

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Monitoring and Evaluation

• The RD or appropriately trained and supervised support personnel including the dietetic technician, registered, may monitor outcomes associated with the following nutrition-related behavior and environmental outcomes:

- Food and nutrient intake outcomes
- Nutrition-related physical sign and symptom outcomes
- Nutrition-related patient/client-centered outcomes

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Let's Practice

Assessment

- 64-year-old male who has been on chemotherapy for 3 months
- Significant weight loss of 12% in 6 months, BMI 18
- Poor intake, consuming 1 – 2 meals/day for the past month
- Reported taste changes and food not tasting like it should
- CRP 12, Albumin 3.4 g/dL, Hemoglobin 8.2 g/dL, Ferritin 1200 mg/dL
- Lack of energy, needs assistance at home from wife and children

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Nutrition Diagnosis

- Nutrition Diagnosis
 - What are some of the problems identified?
 - What are the causes, signs and symptoms?
 - What could be the nutrition diagnosis for this case?

58

Intervention

- What interventions could be applied for this patient?

59

Monitor/Evaluation

- What do we want to monitor for this patient?
- What is the timeframe?
- How will we know if our interventions are working or not working?

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Nutrition Focused Physical Exam

Demonstration and Performance

61

Components of Full Nutrition Focused Physical Examination

- Anthropometrics,
- Body composition
- Head, neck, and oral exam
- Edema

62

General Appearance

- Before beginning a NFPA look at the patient.
 - Observe skin, color, lesions
 - Look for facial symmetry
 - Look for swelling, edema, redness
 - General appearance (clean, unkempt, obese)
 - Mood
 - Do they need assistive device to walk
 - Shake hands not only to establish rapport but to assess coordination

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Anthropometrics, Body Composition, and Metabolic Rate

• Height

- This can be measured against a permanent "ruler" attached to a wall or atop a balance beam scale.
- Shoes should be removed, and the patient may stand with feet together on the floor next to the wall or measuring board or on top of the platform of a balance-beam scale.
- The patient should stand straight and tall. If standing against a wall, the heel, buttocks, shoulder blades, and head should be touching the wall.
- While looking straight ahead, a plastic triangle or the balance beam height arm should be placed in the center of the top of the head.
- While holding the metal arm or plastic triangle still, the patient is then instructed to duck down and step away so that a measurement can be read to the nearest .25 inch.

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Standing Height



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Anthropometrics, Body Composition, and Metabolic Rate

• Arm Span

- Approximately equal to height (within 10%)
- Arms fully extended and parallel to the ground, measure the distance from the tip of the middle finger on one hand to the tip of the middle finger on the other hand

• Demi-Span

- Middle of the sternal notch to the tip middle finger on the left or non-access arm
- Male ht (cm) = (1.40 x demi-span cm) + 57.8
- Female ht (cm) = (1.35 x demi-span cm) + 60.1

Pocket Guide to Nutrition Assessment of the Patient with Chronic Kidney Disease, 4th edition.

66

Anthropometrics, Body Composition, and Metabolic Rate

• Knee-Height

- Knee-height calipers are used with the patient lying on their back or in a sitting position.
- The right leg should be used whenever possible and should be positioned so that the knee and ankle are at 90-degree angles. If access in the leg, use the non-access leg.
- The fixed blade of the caliper should then be positioned under the heel and the sliding blade should rest about two inches behind the patella.
- The shaft of the caliper is held along the line of the tibia.
- Once the fit is snug, the locking lever can be pulled up to lock the sliding blade in place. Looking through the "viewing window" the measure should be recorded to the nearest 1/8 centimeter.
- Take two successive measures that agree within 5 millimeters.

Male ht (cm) = $84.88 - (0.24 \times \text{age}) + (2.02 \times \text{knee height})$
Female ht (cm) = $64.19 - (0.04 \times \text{age}) + (1.83 \times \text{knee height})$

1. www.H-R-Ed.org
 2. Pocket Guide to Nutrition Assessment of the Patient with Chronic Kidney Disease, 8th edition.

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Knee Height



www.H-R-Ed.org

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Anthropometrics, Body Composition, and Metabolic Rate

- Body Weight
- IBW/SBW
- UBW/%UBW
- BMI
- Weight Change

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Anthropometrics, Body Composition, and Metabolic Rate

• Frame Size/Wrist Circumference

- Measured below the radius and ulna.
- Place tape measure beneath and over the top of the wrist with the metal end about centered.
- Pull tape measure tight and then let it relax so that there are no gaps.
- Measure at the point of the metal tip to the nearest mm. Repeat until 3 measures are at the nearest 1 mm.

$$R = ht \text{ (cm)} / \text{wrist circumference (cm)}$$

Small: >10.4 (m); > 11.0 (f)

Medium: 9.6 - 10.4 (m); 10.1 - 11.0 (f)

Large: < 9.6 (m); < 10.1 (f)

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Wrist Circumference



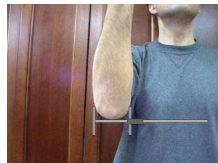
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Anthropometrics, Body Composition, and Metabolic Rate

Elbow Breadth

- Elbow breadth is also used to estimate frame size and has been touted as more reproducible than wrist circumference.
- While the patient holds his elbow at a 90-degree angle with the wrist facing toward the body, calipers are used to measure the breadth between the two prominent bones on either side of the elbow (epicondyles of the humerus)
- Read to the nearest 1 millimeter.
- The reading can be evaluated with consideration to height or age of the patient



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Determination of Frame Size by Elbow Breadth

	Male			Female		
Age	Small	Medium	Large	Small	Medium	Large
18-24	≤ 6.6	> 6.6 and ≤ 7.7	> 7.7	≤ 5.6	> 5.6 and ≤ 6.5	> 6.5
25-34	≤ 6.7	> 6.7 and ≤ 7.9	> 7.9	≤ 5.7	> 5.7 and ≤ 6.8	> 6.8
35-44	≤ 6.7	> 6.7 and ≤ 8.0	> 8.0	≤ 5.7	> 5.7 and ≤ 7.1	> 7.1
45-54	≤ 6.7	> 6.7 and ≤ 8.1	> 8.1	≤ 5.7	> 5.7 and ≤ 7.2	> 7.2
55-64	≤ 6.7	> 6.7 and ≤ 8.1	> 8.1	≤ 5.8	> 5.8 and ≤ 7.2	> 7.2
65-74	≤ 6.7	> 6.7 and ≤ 8.1	> 8.1	≤ 5.8	> 5.8 and ≤ 7.2	> 7.2

Pocket Guide to Nutrition Assessment of the Patient with Chronic Kidney Disease, 4th edition.

73

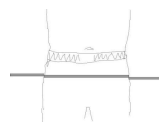
Anthropometrics, Body Composition, and Metabolic Rate

- Circumferences:
 - Mid-Upper Arm Circumference or Midarm Circumference
 - Horizontal measure of the mid-point of right arm: halfway between acromion and olecranon processes
 - Compare Population norms and estimate muscle and fat areas when use with a triceps fat fold
 - $MAMC = MAC - (TSF \times 0.314)$
 - $MAMA = (MAMC^2) / 12.56$
 - Hip Circumference
 - Horizontal measure at the level of the greater trochanter bone
 - Waist Circumference
 - Horizontal measure above the hip bones and at the level of the belly button
 - Used with hip circumference to determine a waist to hip ratio. Males with a ratio > 1.0 and Females with a ratio > 0.8 are considered "apple-shaped" and may be at higher risk for heart disease

1. Pocket Guide to Nutrition Assessment of the Patient with Chronic Kidney Disease, 4th edition.
2. www.HR-R-Ed.org

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Body Circumferences



www.HR-R-Ed.org

75

Anthropometrics, Body Composition, and Metabolic Rate

- Fat-Fold Measure
 - Triceps: back of arm at the midpoint between the acromion process and olecranon process
 - Biceps: front of arm on top of bicep at midpoint
 - Subscapular: at the lower angle point of the scapula bone
 - Suprailiac: at the top of the iliac bone at the mid-axillary line
 - Abdominal: one inch to the right of the belly button

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Anthropometrics, Body Composition, and Metabolic Rate



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Anthropometrics, Body Composition, and Metabolic Rate

- DEXA
- BIA
- Hydrodensitometry



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Anthropometrics, Body Composition, and Metabolic Rate



Handgrip: Dynamometer



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Head, Neck, Oral Exam

- Face and Skin
- Ears
- Eyes
- Nose
- Lips
- Neck
 - Lymph nodes
 - Midline structures
 - Includes trachea and thyroid gland. Note abnormal displacement.
 - Carotid arteries
 - Identification of the sternocleidomastoid muscles
 - Look for a "buffalo hump" or an enlargement along the posterior aspect of the neck

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Head, Neck, Oral, Exam

- Physical Signs of Malnutrition
 - Hair: lack of luster, thin and sparse, easy pluckability = protein/biotin/zinc/EFA
 - Face: diffuse depigmentation, nasolabial dyssebacia = protein/calorie/B-complex
 - Eyes: conjunctival xerosis, Bitot's spots, corneal xerosis, keratomalacia = vitamin A
 - Lips: angular stomatitis, cheilosis, pallor = riboflavin/B complex/iron
 - Nails: koilonychia, splinter hemorrhages, white spotting = iron/vitamin C/zinc
 - Musculoskeletal: enlarged ends of long bones, enlarged cartilage at rib junctions = vitamin C/D

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Body Region	Signs	Possible Deficiencies
Skin	Petechiae	Vitamins A, C
	Purpura	Vitamins C, K
	Pigmentation	Niacin
	Edema	Protein, vitamin B1
	Follicle	Folic acid, iron, biotin, vitamins B12, B6
	Decubitus	Protein, energy
	Schorrish dermatitis	Vitamins B6, biotin, zinc, essential fatty acids
	Unhealed wounds	Vitamin C, protein, zinc
Nails	Fallor or white coloring	
	Clubbing, spoon-shape, or transverse ridging/banding; excessive dryness; darkness in nails, curved nail ends	Iron, protein, vitamin B12
Head/Hair	Dull/lackluster; banding/sparse; alopecia; degeneration of hair; scaly/flaky scalp	Protein and energy, biotin, copper, essential fatty acid
Eyes	Fallor conjunctiva	Vitamins B12, folic acid, iron
	Night vision impairment	Vitamin A
Oral cavity	Photophobia	Zinc
	Glossitis	Vitamins B2, B6, B12, niacin, iron, folic acid
	Gingivitis	Vitamin C
	Fluores, stomatitis	Vitamin B2, iron, protein
	Cheilitis	Niacin, vitamins B2, B6, protein
	Pale tongue	Iron, vitamin B12
Nervous system	Atrophied papillae	Vitamins B2, niacin, iron
	Mental confusion	Vitamins B1, B2, B12, water
	Depression, lethargy	Biotin, folic acid, vitamin C
	Weakness, leg paralysis	Vitamins B1, B6, B12, pantothenic acid
	Peripheral neuropathy	Vitamins B2, B6, B12
	Ataxia	Vitamin B12
	Hyporeflexia	Vitamin B1
	Muscle cramps	Vitamins B6, calcium, magnesium
	Fatigue	Energy, biotin, magnesium, iron

Reber E et al. J. Clin. Med. 2019; 8, 1005.

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Medications and Vitamin Status

Drug	Deficiency	Malabsorption	Increased requirements	Decrease	Antagonism
Antacids	Thiamine (B ₁)				
Antibiotics	Vitamin K				
Anticonvulsants	Vitamins D, folic acid				
Antineoplastic	Folic acid				Folic acid
Antipsychotics					Riboflavin (B ₂)
Cathartics					
Cholestyramine	Vitamins A, D, E, K, beta-carotene				
Cardiovascular					Vitamins A, D, C
Diuretics (loop)	Thiamine (B ₁)				
H ₂ -antagonists	Vitamin B ₁₂				
Isotretinoin	Vitamin A				
Mineral oil	Vitamins A, D, E, K				
Orlistat	Vitamins A, D, E, K				
Pantolamide	Folic acid				
Proton pump inhibitors	Vitamin B ₁₂				

Chessman KH, Kumf VI. Assessment of nutrition status and nutrition requirements. In: DiPiro JT, Talbert RL, Yee GC, et al, eds. Pharmacotherapy: A Pathophysiologic Approach. 6th ed. New York, NY: McGraw-Hill Inc; 2005:2559-2577

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Head, Neck, Oral Exam

- Intra-Oral Examination
 - Lips
 - Buccal Mucosa
 - Mucobuccal Folds (Vestibule)
 - Hard Palate
 - Soft Palate
 - Tongue and Floor of Mouth
 - Atrophic papillae = iron
 - Gingiva (gums)
 - Spongy, bleeding, bright red, ulcerations = vitamin C/A/folate/B12
 - Dentition

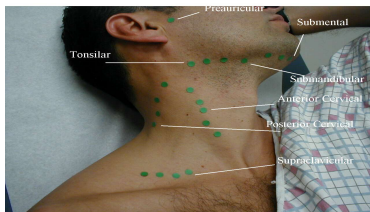
84

Head, Neck, Oral Exam

- TMJ or TMD
 - Muscles allow for chewing and speaking
 - Masseter, temporalis, and lateral pterygoid
 - Trigeminal, facial, glossopharyngeal, vagus, and spinal accessory nerves
 - Observe mandibular movements during opening and closing. Normal opening approximately 3 finger widths.
 - Place index fingers just in front of the tragus or each ear and have patient open and close mouth.

85

Lymphnodes

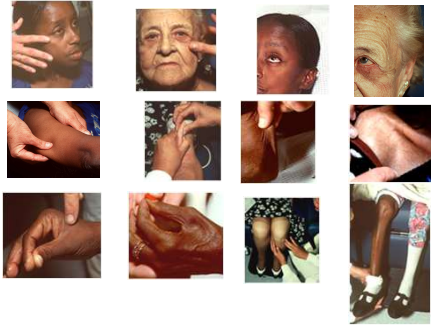


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Anthropometrics, Body Composition, and Metabolic Rate

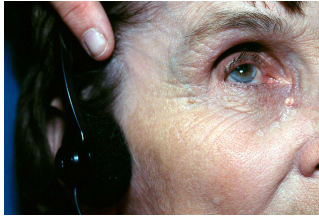
- Subcutaneous Fat
 - Below the eye
 - Triceps/Biceps
- Muscle Wasting
 - Temple
 - Clavicle
 - Shoulder
 - Scapula
 - Interosseous muscle
 - Knee
 - Quadriceps
 - Calf
- Edema

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Temple of elderly patient with 5% weight loss in 6 months.



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Clavicle of elderly patient with 12% weight loss in 6 months



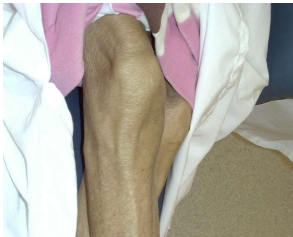
90

Shoulder of middle-aged patient with has decreased 3% over 6 months



91

Knee of elderly patient with 10% weight loss in 6 months



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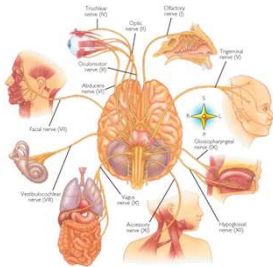
NFPE Bonus Material

Cranial Nerves

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Head, Neck, Oral Exam

- Cranial Nerves
 - Olfactory (I)
 - Optic (II)
 - Oculomotor (III)
 - Trochlear (IV)
 - Trigeminal (V)
 - Abducens (VI)
 - Facial (VII)
 - Vestibulocochlear (VIII)
 - Glossopharyngeal (IX)
 - Vagus (X)
 - Spinal Accessory (XI)
 - Hypoglossal (XII)



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Head, Neck, Oral Exam

- Dysphagia Screening
 - Check cognition level (ask name, date, and/or where is the patient)
 - Determine ability to follow basic directions
 - Cranial nerves tested: V, VII, IX, X, XII
 - Test recognition of sharp, dull, and touch
 - Test motor function and resistance
 - Testing for sensation of sweet, salt, and sour by having patient smile and raise eyebrows
 - Check gag reflex and look for pharyngeal elevation and tongue retraction
 - Test tongue strength

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Practice Time

- Work in partners to practice the techniques demonstrated and described in the PPT.

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Putting it all Together - Let's Practice

- 55 y/o patient with history of diabetes, cerebral vascular accident, and hypertension
- Weight 55 kg, BMI: 20, %Weight Change: 8% loss in 6 months
- NFPE: moderate wasting at temple, interosseous, knee, clavicle, scapula, and triceps
- GI symptoms: fair to poor appetite, early satiety, nausea
- Family support at home for grocery shopping, cooking

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Putting it all Together - Let's Practice

- Is this patient at nutrition risk?
- What could be a nutrition diagnosis for this patient?
- What interventions could be applied?
- How can we monitor and evaluate to see if our interventions are appropriate?

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Summary

- Malnutrition is multifactorial and patients should be screened and monitored.
- The Nutrition Care Process is completed in four steps: assessment, nutrition diagnosis, intervention, and monitoring and evaluation.
- A nutrition diagnosis is in the format of a (P)roblem (E)tiology (S)igns/symptoms statement.
- Choose the best nutrition diagnosis that you can intervene for during your assessment.
- Dietitians should monitor interventions to evaluate improvement in patient outcomes or goals.
- Components of a NFPE include anthropometrics; body composition; head, neck, and oral exam; and edema

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Thank You!

- Questions?
- Contact: melissa.rdlid@gmail.com
