

IDENTIFYING MALNUTRITION IN PEDIATRIC ONCOLOGY PATIENTS THROUGH NUTRITION-FOCUSED PHYSICAL EXAM

**Oncology
Nutrition**

a dietetic practice group of the
 Academy of Nutrition
and Dietetics

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SPEAKER DISCLOSURES

Owner,
Be Balanced Nutrition, LLC

Independent Contractor,
Abbott Nutrition Health Institute
(ANHI)

LEARNING OBJECTIVES

1

Outline criteria for diagnosing pediatric malnutrition

2

Identify malnutrition risk factors over the course of childhood cancer treatment

3

Describe the components of a head-to-toe physical exam

4

Identify focus areas for NFPE in the pediatric oncology patient population

PEDIATRIC MALNUTRITION

- **Imbalance** between *nutrient requirements* and *intake* resulting in **cumulative deficits** in *energy, protein, or micronutrients* that may negatively affect growth, development, and other relevant outcomes
- 5 key domains
 - Anthropometry, etiology & chronicity (illness-related or nonillness-related, acute or chronic), mechanism, imbalance, outcomes
- 4 mechanisms for **illness-related** malnutrition
 - Decreased intake/starvation, increased requirement/hypermetabolism, increased losses, altered utilization of nutrients

Special Report

Defining Pediatric Malnutrition: A Paradigm Shift Toward Etiology-Related Definitions

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and Enteral Nutrition (A.S.P.E.N.) Board of Directors

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FROM THE ACADEMY
Consensus Statement



Consensus Statement of the Academy of Nutrition and Dietetics/American Society for Parenteral and Enteral Nutrition: Indicators Recommended for the Identification and Documentation of Pediatric Malnutrition (Undernutrition)



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CONSENSUS STATEMENT INDICATORS

Indicators (<2 years old)	Indicators (>2 years old)	# of Data points (value)
Weight-for-length	Body Mass Index (BMI)	One (z score)
Length	Height	One (z score)
MUAC	MUAC	One (z score)
Growth velocity	Weight loss	Two (% norm/usual)
Decline in wt-for-length z score	Decline in BMI-for-age z score	Two (difference)
Dietary intake	Dietary intake	Two (% estimated)

PRIMARY INDICATORS

One Data Point

Indicator (z score)	Mild Malnutrition	Moderate Malnutrition	Severe Malnutrition
Weight-for-length (1 mo – 2 yrs)	-1 to -1.9	-2 to -2.9	-3 or below
BMI-for-age (2 – 18 yrs)	-1 to -1.9	-2 to -2.9	-3 or below
MUAC (6 mo – 5 yrs)	-1 to -1.9	-2 to -2.9	-3 or below
Length/height-for-age (1 mo – 18 yrs)	No data	No data	-3 or below

Becker PJ et al. *J Acad Nutr Diet*. 2014;114(12):1988-2000.

PRIMARY INDICATORS


Two Data Points

Indicator	Mild Malnutrition	Moderate Malnutrition	Severe Malnutrition
Growth velocity (<2 yrs of age)	<75% of norm for expected wt gain*	<50% of norm*	<25% of norm*
Weight loss (2 – 18 yrs of age)	5% usual body weight	7.5% usual body weight	10% usual body weight
Decline in wt-for-length or BMI-for-age z score	↓ of 1 SD	↓ of 2 SD	↓ of 3 SD
Inadequate nutrient intake	51 – 75% estimated energy/protein needs	26 – 50% estimated energy/protein needs	≤25% estimated energy/protein needs

Becker PJ et al. *J Acad Nutr Diet.* 2014;114(12):1988-2000.

*using WHO 2006 weight velocity standards
SD: standard deviation(s)

EVALUATING THE INDICATORS

- The “Malnutrition Clinical Characteristics Validation and Staffing Study” is underway and has the following specific aims:
 1. Determine the predictive validity of the MCC, or indicators, in relation to patient outcomes
 2. Determine the interrater reliability of the indicators
 3. Quantify the amount of RDN care that is associated with improved inpatient outcomes
 - Two-year study timeline with goal of 600 adult and 600 pediatric patients from 60 facilities
 - Funded by the Academy Foundation and administered under the leadership of the Academy’s RISA team and Dr. Alison Steiber as principal investigator and co-investigator Dr. Elizabeth Yakes Jimenez, Director of the DPBRN
- 

Malnutrition Risk in the Pediatric Oncology Population: PREVALENCE

- Malnutrition prevalence at diagnosis and during treatment varies based on disease process (Brinksma A et al. *Crit Rev Oncol Hematol*. 2012;83:249-275.)
 - Leukemia: 5–10% at diagnosis, 0–5% during treatment
 - Neuroblastoma: 50% at diagnosis, 20–50% during treatment
 - Solid tumors: estimated 0–30% at diagnosis and during treatment
 - Less is known about patients with brain tumors: one study found 31% of patients with medulloblastoma to be malnourished at diagnosis
- 0–65% prevalence in pediatric cancer patients as defined by BMI, wt loss, MUAC, or TSF based on a review of 46 studies (Iniesta RR et al. *Nutr Rev*. 2015;73:276-295.)
- ~25% of children showed a significant reduction in z scores for wt-for-age, ht-for-age, or wt-for-ht at dx (Brinksma A et al. *Pediatr Blood Cancer*. 2015;62:269-273.)
- A multicenter cohort study assessed prevalence of malnutrition at dx and during therapy at multiple intervals (Zimmermann K et al. *Pediatr Blood Cancer*. 2013;60:642-649.)
 - 5.8% of patients had BMI z scores below -2 at dx
 - During therapy, incidence rose to 22–47% (based on BMI z score under -2 OR wt loss >10% from dx)
 - Age >10 at dx, BMI under -1 at dx, and medulloblastoma were positively associated with a higher proportion of malnutrition time during therapy
- ~33% of children with cancer demonstrated z scores under -2 for wt-for-age, ht-for-age, wt-for-ht, or BMI-for-age (Srivastava R et al. *Indian J Cancer*. 2015;52:199-201.)
 - Malnutrition positively associated with solid tumors and those coming from rural communities
 - Higher prevalence of wasting in ages <5 years

More on Malnutrition Risk in the Pediatric Oncology Population

OUTCOMES

Morbidity and infectious complications, mortality/survival, body composition, quality of life measures

- Malnutrition during initial phase of therapy associated with worse survival, and weight loss of >5% in first 3 months after dx associated with increased presence of febrile neutropenic episodes with bacteremia in 1st year after dx (Loeffen EA et al. *Support Care Cancer*. 2015;23:143-150.)
- Despite initial wt loss, BMI and fat mass increased during and after treatment—resulting in a 100% increase in # of overnourished pts—but fat-free mass (which was low at dx) remained low (Brinksma et al. *Clin Nutr*. 2015;34:66-73.)
- Undernutrition and weight loss associated with lower health-related QOL scores, specifically in physical functioning, emotional and social functioning, pain, and nausea (Brinksma A et al. *Support Care Cancer*. 2015;23:3043-3052.)

NUTRIENTS OF CONCERN

- Based on inadequate intakes, lab values reflective of depletion, or treatment side effects
 - Vitamin D
 - Vitamins A, C, and E
 - Magnesium
 - Selenium
 - Zinc

(Helou M et al. 2014; Kletzel M et al. 2014;
Slegtenhorst S et al. 2015; Kaplinsky C et al. 2013;
Gröber et al. 2016)

Table 4: Pediatric patients risk for malnutrition according to disease, treatment and demographics

	High risk of malnutrition	High risk of adiposity
Tumor type	Presentation with and/or undergoing treatment for Solid tumor in advance stages Neuroblastoma Wilms tumor Rhabdomyosarcoma Undergoing treatment for Advanced stage Ewing sarcoma Multiple relapsed and some high-risk leukemia Head and neck tumors Diencephalic tumors Poststem cell transplantation (graft vs. host disease)	Presentation with and/or undergoing treatment for Central nervous system tumors Craniopharyngioma Medulloblastoma Astrocytoma Undergoing treatment for ALL Ependymoma Nasopharynx carcinoma Sarcoma Lymphoma Disseminated testicular cancer
Treatment modality	Irradiation to the GIT Major abdominal surgery Bone marrow transplant Intense frequent intervals of chemotherapy (<3 weeks) in the absence of corticosteroids	Extensive brain surgery High dose cranial/cranial spinal radiotherapy Total body or abdominal radiotherapy Prolonged corticosteroid therapy with large doses or other drugs that can increase body fat stores
Patient demographics	Infancy Low social-economic status Lack of family or health supports system	Brain tumors Female Greater than %BMI at diagnosis ALL <10 years at diagnosis Hispanic Male

GIT=Gastrointestinal tumor; ALL=Acute lymphoblastic leukemia; BMI=Body mass index

diagnosis

Every day,
43 children

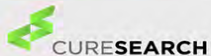


are diagnosed with
cancer



60%

of children who
survive cancer
**suffer long-term
side effects**



treatment

More than

40,000 kids



are in **cancer treatment**
each year



survivorship

NUTRITION-FOCUSED PHYSICAL EXAM (NFPE)

Standards of Practice for Registered Dietitian Nutritionists

Standard 1: Nutrition Assessment

The registered dietitian nutritionist (RDN) uses accurate and relevant data and information to identify nutrition-related problems.

“Each RDN:

Obtains and assesses findings from NFPE (eg, indicators of vitamin/mineral deficiency/toxicity, edema, muscle wasting, subcutaneous fat loss, altered body composition, oral health, feeding ability [suck/swallow/breathe], appetite, and affect.)”

J Acad Nutr Diet. 2018;118(1):132-140.e15.

GETTING STARTED

TOOLS

eyes; hands; tape measure;
penlight; tongue depressor; oral
swab, or gauze; dynamometer;
gown and gloves

TECHNIQUES

inspection, palpation,
percussion, auscultation

BEFORE YOU BEGIN...

- Thorough medical record review
- Start with general survey
- Introduce yourself, explain process and rationale, ask permission
- Hand hygiene, universal precautions

TYPES OF NFPE

Comprehensive
OR
Focused

NFPE COMPREHENSIVE ASSESSMENT

Subcutaneous Fat Loss

Eyes, cheeks, upper arms, torso/buttocks

Bilateral Muscle Wasting

Temples, chest, shoulders, back, thighs/knees, calves

Micronutrient Exam

Hair, eyes, mouth, skin, nails

Hydration/Fluid Status

Dehydration, edema (generalized, sacral, lower extremity)

Functional Status

Developmental milestones, baseline activity, grip strength

SUBCUTANEOUS FAT LOSS

NFPE Region	Anatomical Landmarks	Well Nourished	Mild – Moderate Malnutrition	Severe Malnutrition
Orbital Fat Pads (Eyes)	Orbital bones/eye socket and brow bone (supraorbital ridge)	Slightly bulged fat pads	Slightly dark circles	Hollow, depressed dark circles; loose skin, prominent brow bone, “hollow-eye” appearance
Buccal Fat Pads (Cheeks)	Cheek bones (zygomatic or malar bones) and upper lip	Full, round, filled out cheeks	Flat cheeks	Hollow, sunken, narrow face
Triceps (Upper Arm)	Back of upper arm midway between elbow and armpit when shoulder and elbow are flexed to 90°	Thick fat fold between the fingers	Some space between the fingers	Minimal space between fingers with fingers almost touching
Torso/Trunk (Ribcage, Lower Back, Pelvis)	Costal arch and intercostal spaces of front ribs, midaxillary line, thoracic and lumbar vertebrae, iliac crest of pelvis; buttocks (infants and children)	Ribs do not show in the front of the body when facing the patient; slight to no protrusion of iliac crest	Apparent ribs with slight depressions in intercostal spaces; iliac crest somewhat prominent	Very apparent depressions between ribs and around costal margin; iliac crest very prominent

ANATOMICAL LANDMARKS: FAT LOSS

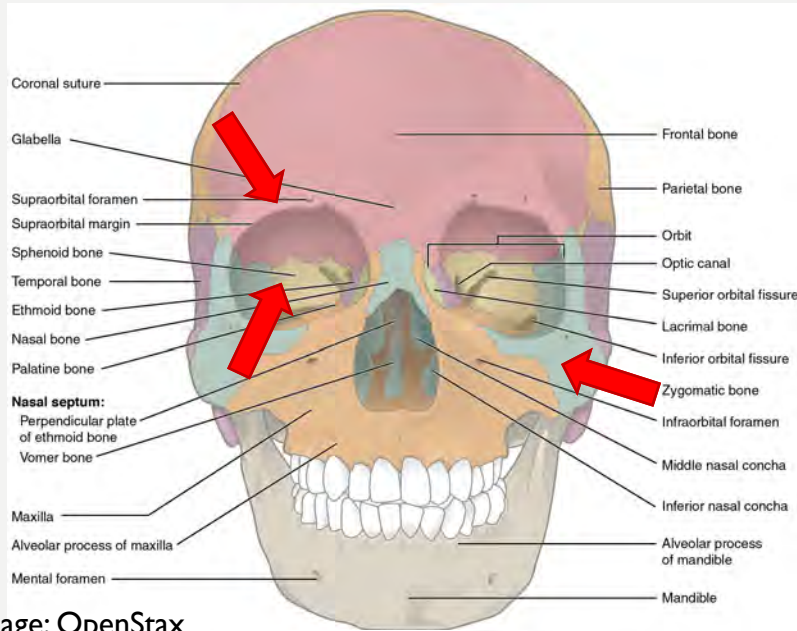


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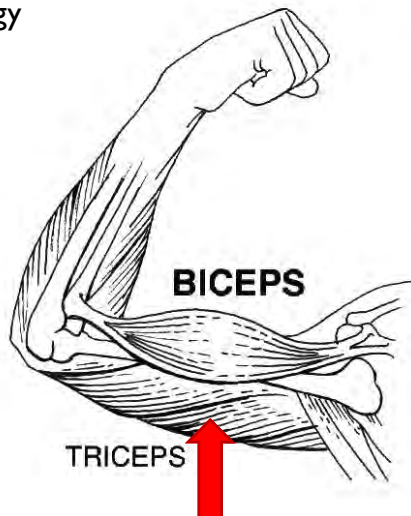


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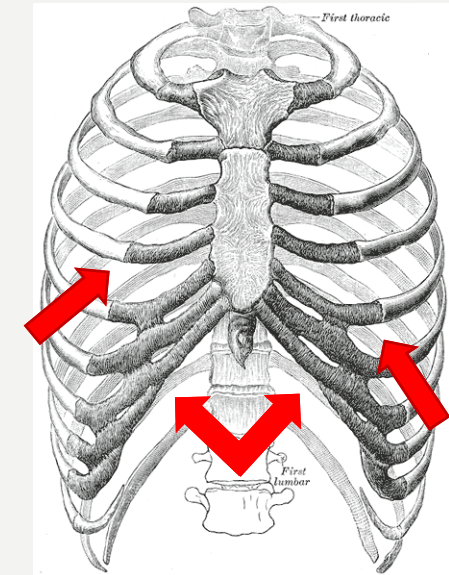


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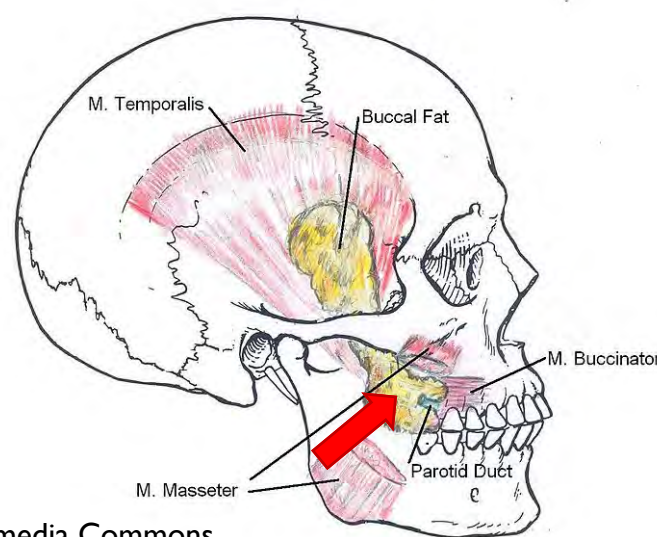
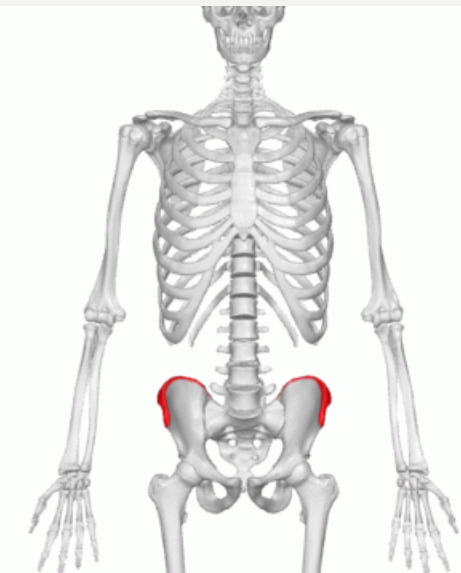


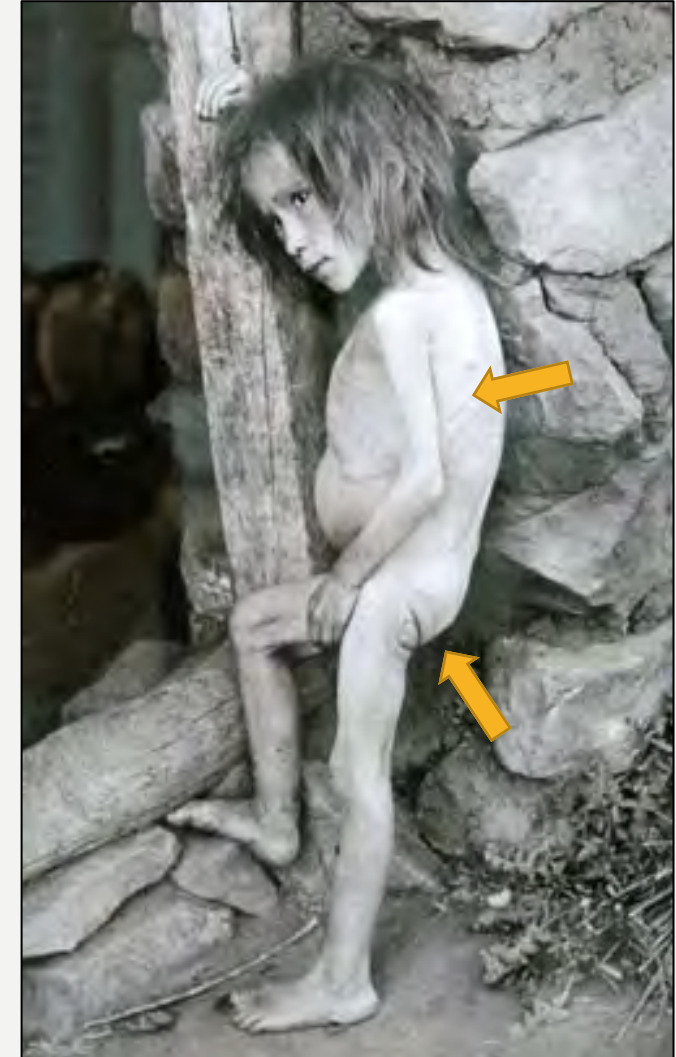
Image:Wikimedia Commons,
Otto Placik



GIF:Wikimedia Commons, BodyParts3D

EXAMPLES OF FAT LOSS

Orbital Fat Loss
Buccal Fat Loss
Upper Arm Fat Loss
Trunk/Torso Fat Loss



Images: (left) PHIL, CDC; (center) Wikimedia Commons, Fotograaf Onbekend/Anefo; (right); Wikimedia Commons, Fridtjov Nansen

MID-UPPER ARM CIRCUMFERENCE (MUAC)

PROCEDURE

- Position child facing away from you with elbow flexed to 90° angle in sagittal plane and palm facing up
- Palpate acromion process of the shoulder, then measure distance from posterior aspect to olecranon process of the elbow
- Average two measurements, mark the midpoint, and have child relax marked arm at side
- Use non-stretchable flexible tape to measure around arm at midpoint to nearest 0.1 cm

COMPARATIVE STANDARDS

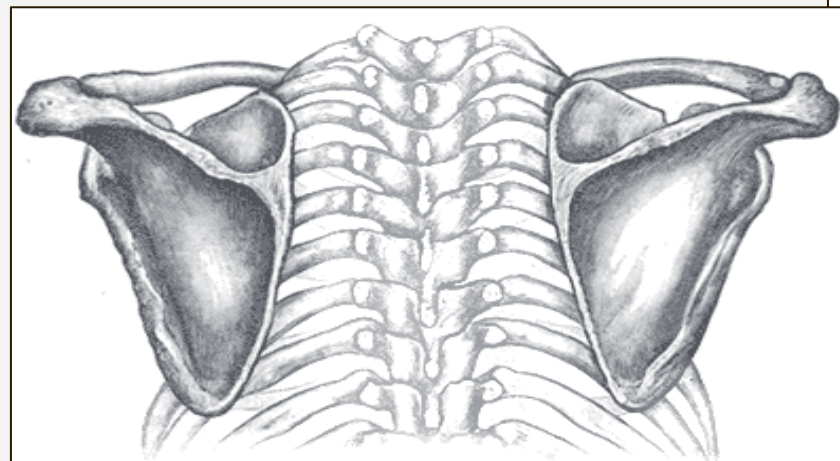
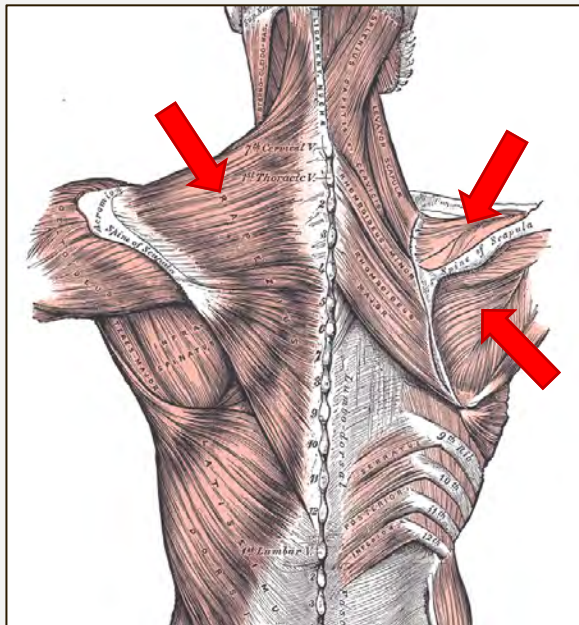
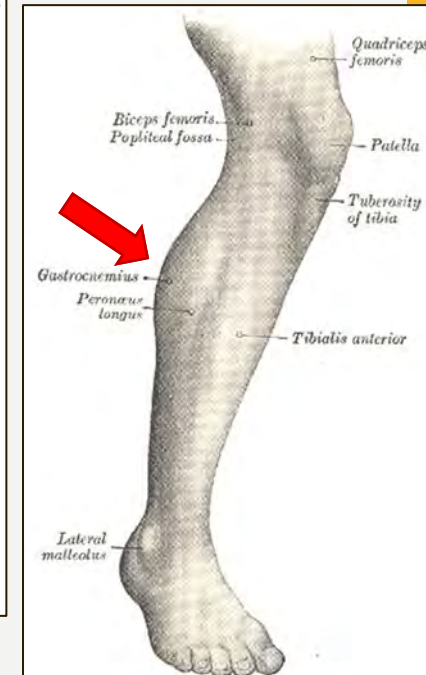
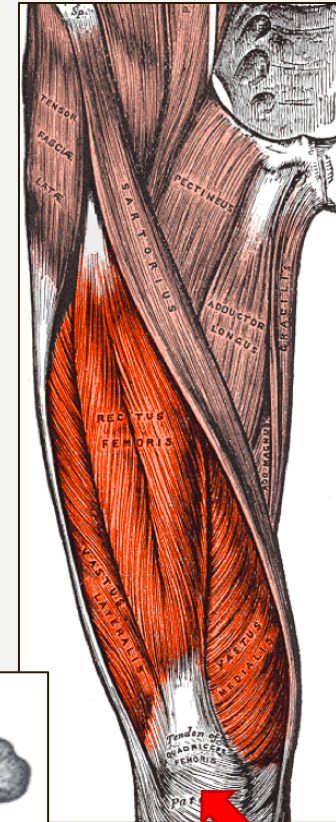
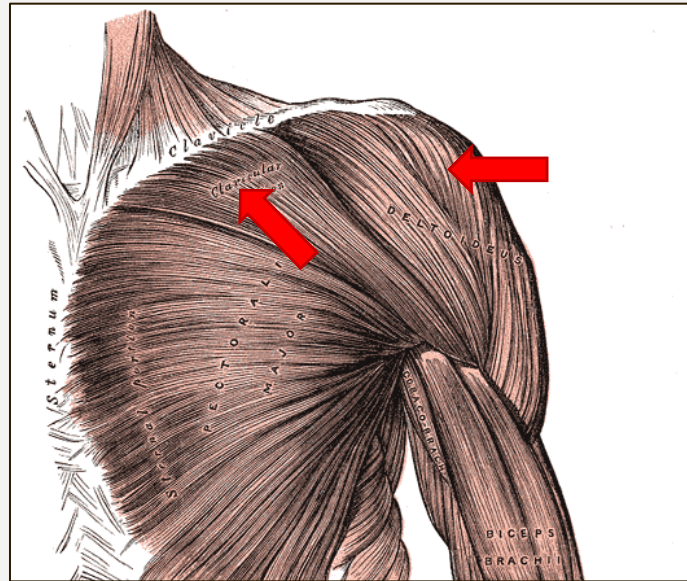
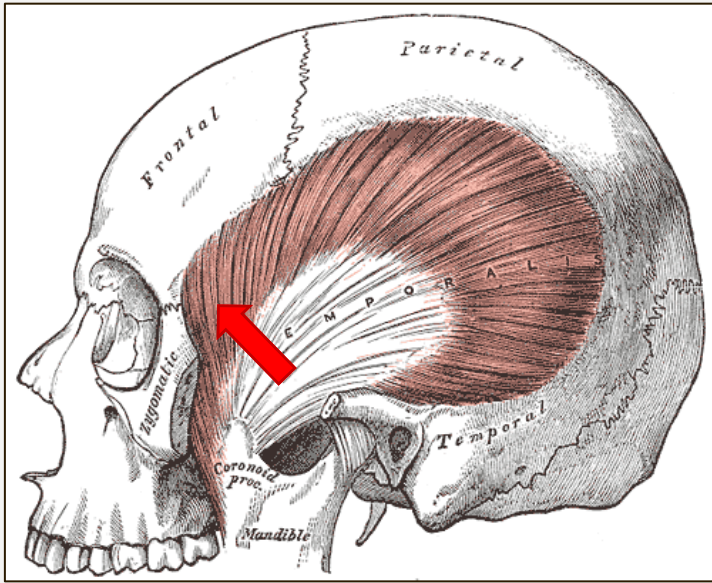
- WHO MGRS data, including z scores, are available for ages 3 months to 5 years
 - Measurements taken on *left* arm
- NHANES MUAC data from 1999-2012 used to generate z scores for ages 2 months to 18 years (Abdel-Rahman et al. 2017.)
 - Measurements taken on *right* arm
- Both available at www.peditools.org



BILATERAL MUSCLE WASTING

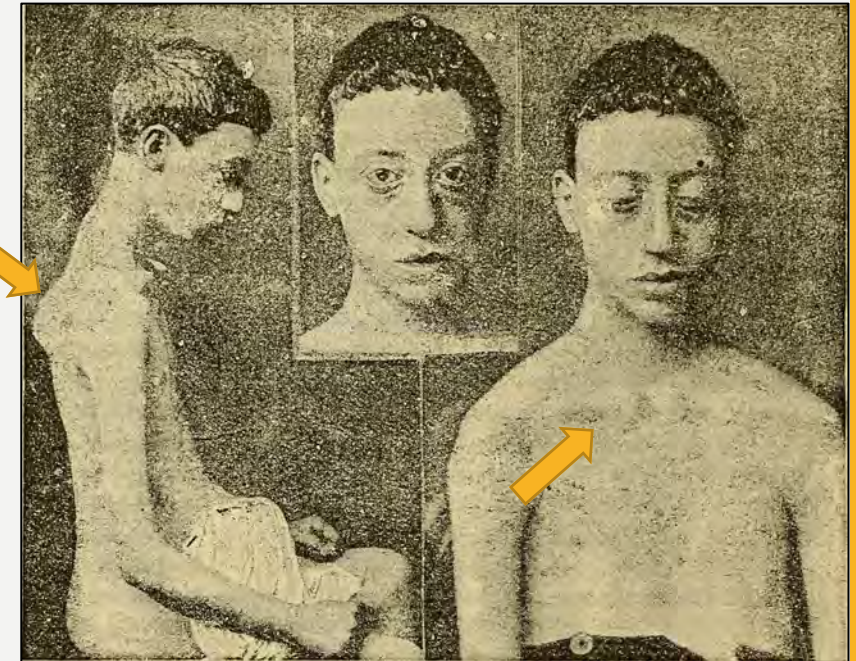
	NFPE Region (Muscle)	Anatomical Landmarks	Well Nourished	Mild – Moderate Malnutrition	Severe Malnutrition
More Sensitive	Temples (Temporalis)	Temporalis muscle	Well-defined muscle	Slight depression	Hollowing or scooping depression
	Chest (Pectoralis Major)	Clavicle	Clavicle visible but not prominent; fingers should not slide under clavicle	Some protrusion of clavicle	Protruding, prominent clavicle
	Shoulders (Deltoid)	Acromion process	Rounded, curved junction between shoulders and neck	Slight protrusion of acromion process; shoulders not square	Square shoulders with prominent bones
	Back (Trapezius, Supraspinatus, Infraspinatus)	Scapula	Scapula not prominent, no evident depressions around scapular borders	Some areas of scapula are evident	Prominent scapula with depressions above, between, and below
Less Sensitive	Anterior Thigh and Knee (Quadriceps)	Patella	Quadriceps protrude, muscle is well-rounded without depressions, and patella is not prominent	Noticeable patella with little muscle mass; slight depression along inner thigh	Square, prominent knee with no muscle mass; obvious depression along inner thigh
	Calf (Gastrocnemius)	Posterior calf	Firm, bulb-shaped muscle	Some shape and firmness	Thin, flat muscle without definition

LANDMARKS: MUSCLE WASTING



All Images: Wikimedia Commons,
Gray's Anatomy

EXAMPLES OF MUSCLE WASTING



Temporalis, Pectoralis Major,
Deltoid, Back Muscles,
Quadriceps, and Gastrocnemius
Wasting

Images: Wikimedia Commons, Fridtjof Nansen
(left); Wikimedia Commons, unknown (center);
Flickr, Public Domain (right)

MICRONUTRIENT EXAM



- Look for signs and symptoms of specific nutrient deficiencies
 - Primary deficiency (inadequate intake)
 - Secondary deficiency (altered utilization)
 - Medical condition or illness, medications including chemotherapy, treatments including radiation and surgery, etc.
- Use in conjunction with serum/laboratory markers
 - Presence of inflammation can skew values and may influence timing of collection and/or interpretation of results
- Collaborate with subspecialists as indicated
 - Ophthalmology, dentistry, dermatology, others...

BLEOMYCIN

A chemotherapy drug. An anti-tumor antibiotic, bleomycin is a mixture of cytotoxic glycopeptides isolated from a bacterium (*Streptomyces verticillus*).

Administration: IV, IM. Common pediatric IV dose is 5-10 U/m².

Types of pediatric cancers: Osteosarcoma, lymphomas.

Side effects (during/soon after treatment): High fever, chills, Raynaud's phenomenon (low blood flow in the extremities causing coldness in fingers), hyperpigmentation, and mouth sores. Occasional effects include rash, taste changes, anorexia, and pneumonitis (inflammation of the lungs).

Possible long term effects: Pulmonary toxicity (pneumonitis, pulmonary fibrosis). High risk factors include: Bleomycin greater than 400 U/m²; if bleomycin was combined with radiation (chest, TBI); if bleomycin was combined with busulfan or lomustine. (From the COG Late Effects Guidelines. 3/15)

Other names: Blenoxane, Bleocin, Cytorich.

Links to more information:

CHEMOTHERAPY RESOURCES

www.chemocare.com

Nail Changes

What are nail changes?

There are several types of nail changes which may occur in patients receiving chemotherapy. The most common of these skin reactions seen, particularly in dark-skinned persons, is hyperpigmentation (darkening). Vertical or horizontal bands, or general darkening. Drugs in which these skin reactions been known to occur include:

- Bleomycin, cyclophosphamide, daunorubicin, doxorubicin, fluorouracil, hydroxyurea, aminoglutethimide, busulfan, cisplatin, dacarbazine, docetaxel, idarubicin, ifosfamide, melphalan, methotrexate, mitomycin and mitoxantrone.
- This hyperpigmentation generally grows out with the nail.

Other nail changes include:

- Beau's lines (horizontal depressions of the nail plate). These skin reactions can occur a few weeks after a course of chemotherapy.
- Mee's lines (white horizontal discoloration of the nail plate involving the entire nail width).
- Leukonychia (white horizontal discoloration involving partial nail width).
- Onycholysis (The separation or loosening of a fingernail or toenail from its nail bed).
- Onychodystrophy (A malformation of the nail).

All of these skin reactions are temporary and eventually resolve once the drug causing the change is stopped and the affected nails grow out (this may take weeks to months).

Things you can do to manage nail changes:

- Nails should be trimmed and kept clean.
- Gloves should be worn for housecleaning and gardening to minimize damage and prevent infection.
- Nail polish and imitation fingernails should not be worn until the nails have grown out and returned to normal.

Drugs that may be prescribed by your doctor for skin reactions:

- Antibiotics may be necessary to treat infections in the nail beds.

Notify your doctor or health care provider if:

- You suspect an infection of the nails.

Note: We strongly encourage you to talk with your health care professional about your specific medical condition and treatments. The information contained in this website about skin reactions and other medical conditions is meant to be helpful and educational, but is not a substitute for medical advice.

American Childhood Cancer Organization:
<https://www.acco.org/drugs-chemotherapy-drugs-and-other-pharmaceuticals>

HAIR

Signs	Possible Micronutrient Deficiency
Alopecia (thin, sparse, patchy)	Iron, zinc*, biotin
Color changes, depigmentation, lackluster	Manganese, selenium*, copper
Easily pluckable	Essential fatty acids, zinc*
Corkscrew hair (coiled, swan-necked)	Vitamin C*
Flag Sign	Protein-calorie malnutrition
Lanugo	Calorie deficiency



Photos: (left, bottom left) Creative Commons, Feed My Starving Children (FMSC); (bottom right) ADAM, NIH



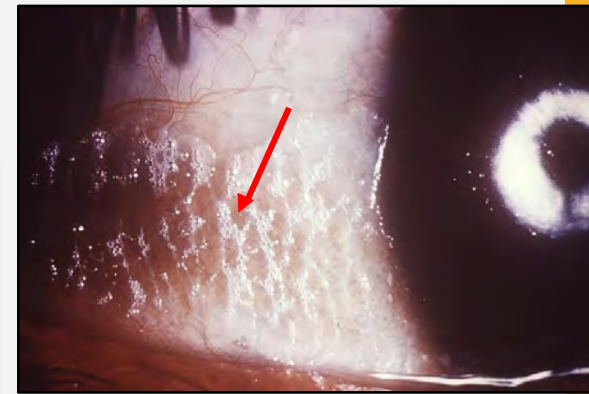
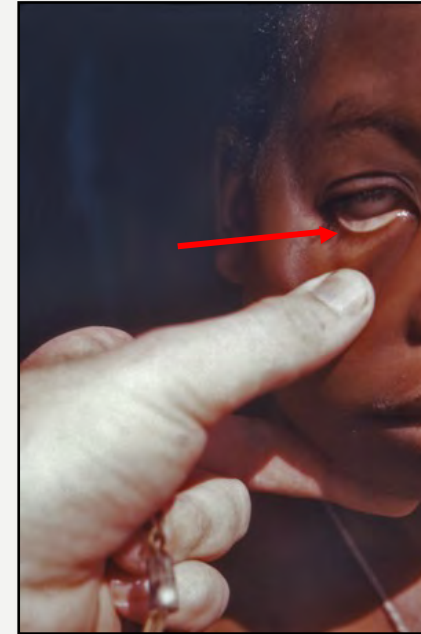
Technique

Starting at scalp, inspect hair from root to tip looking for alterations in color, pigmentation, distribution pattern, shine, texture, and quantity

EYES

Signs	Possible Micronutrient Deficiency
Angular blepharitis	Riboflavin, biotin, vitamin B6, zinc*
Pale conjunctiva	Vitamin B6, vitamin B12, folate, iron, copper, anemias
Night blindness, dry membranes, dull/milky cornea, keratomalacia, Bitot's spots	Vitamin A*
Ophthalmoplegia	Thiamin, phosphorus
Angular palpebritis; red, inflamed conjunctiva; swollen eyelids	Niacin, riboflavin, iron, vitamin B6

Photos: PHIL, CDC



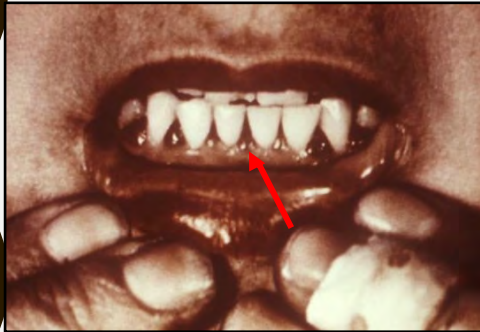
Technique

1. Have patient look left, right, and up while inspecting sclera for color, dryness, or plaques using penlight in a wide “W” motion
2. Gently pull lower eyelid down to assess conjunctiva for color/paleness

MOUTH

Technique

Inspect (1) mouth/lips, (2) teeth/gums, and (3) tongue for oral hygiene, dry or cracked lips, sores, cavities, bleeding gums, and color/texture of tongue



Signs	Possible Micronutrient Deficiency
Angular stomatitis or cheilitis	Riboflavin, niacin, iron, vitamin B6, vitamin B12
Smooth, beefy red tongue	Vitamin B12, niacin
Purplish/magenta tongue	Riboflavin
Glossitis	Riboflavin, niacin, vitamin B6, vitamin B12, folate, severe iron deficiency
Pale tongue	Vitamin B12, folate, iron
Gingivitis, bleeding gums	Vitamin C*, niacin, folate, zinc*, severe vitamin D deficiency*

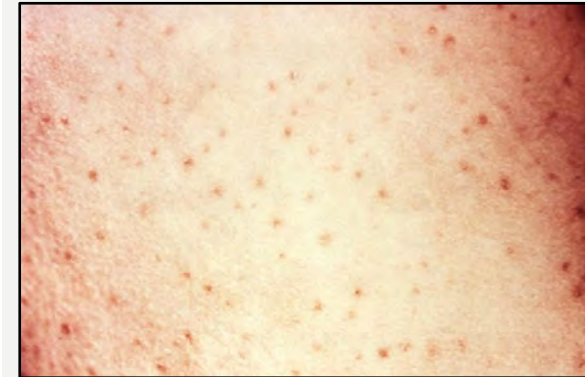
Photos: PHIL, CDC

SKIN

Signs	Possible Micronutrient Deficiency
Eczema	Riboflavin, zinc*
Follicular hyperkeratosis	Vitamin A* or vitamin C*
Pallor	Iron, vitamin B12, folate, anemia
Pellagra	Niacin, tryptophan, vitamin B6
Perifollicular hemorrhage	Vitamin C*
Petechiae	Vitamin C*, vitamin K
Poor wound healing, pressure ulcers	Zinc*, vitamin C*
Purpura	Vitamin C*, vitamin K, excessive vitamin E
Seborrheic dermatitis	Biotin, vitamin B6, zinc*, riboflavin, essential fatty acids, vitamin A excess or deficiency*
Xerosis, abnormal dryness	Vitamin A*, essential fatty acids

Technique

Inspect for color changes, texture, lesions, rashes, turgor, hygiene, temperature, and integrity



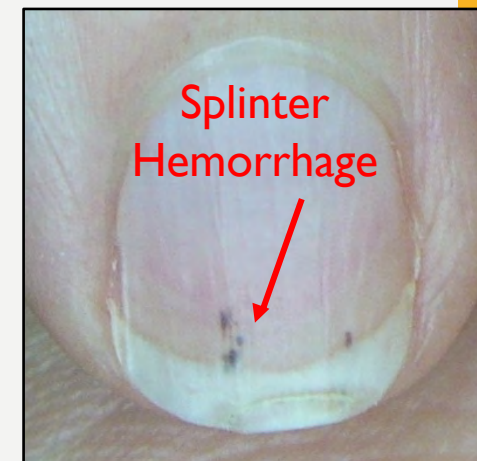
Photos: PHIL, CDC

NAILS

Signs	Possible Micronutrient Deficiency
Koilonychia (spoon-shaped, concave)	Iron, anemia
Mottled, poor blanching, pale	Vitamin A*, vitamin C*
Beau's lines (transverse ridges, horizontal grooves)	Severe zinc* deficiency, hypocalcemia
Muehrcke's lines (transverse white lines)	Malnutrition, hypoalbuminemia
Central ridges	Iron, folate
Splinter hemorrhage	Vitamin C*
Brittle, soft, dry, weak or thin, split easily	Magnesium*, severe malnutrition, vitamin A and selenium toxicity

Technique

Inspect for color, length, shape, symmetry, texture, and capillary refill. Findings related to nutritional deficiencies are typically found on all nails.



Photos:Wikimedia Commons: (top L) Lyrl, (top R) Elipongo, (bottom L) Yannick Trottier, (bottom R) Splarka

HYDRATION/FLUID STATUS

DEHYDRATION

- Lab Findings
 - Increased sodium, chloride, BUN, Cr, serum osmolality, urine specific gravity
- Clinical Findings
 - Hypotension, tachycardia, delayed capillary refill
- Physical Findings
 - Weight loss, sunken eyes, dark urine or decreased urine output, dry mucous membranes, thick saliva, clammy skin, cracked lips, poor skin turgor

OVERHYDRATION

- Lab Findings
 - Decreased sodium, chloride, BUN, Cr, serum osmolality, urine specific gravity
- Clinical Findings
 - Hypertension, elevated central venous pressure (CVP)
- Physical Findings
 - Weight gain, puffy eyes, light colored urine, moist skin, anasarca, dyspnea, lung crackles
 - Edema: generalized, sacral, lower extremity

Reference: Litchford MD. Clinical: biochemical, physical, and functional assessment. In: Mahan LK, Raymond JL, eds. *Krause's Food & the Nutrition Care Process*. 14th ed. St. Louis, MO: Elsevier; 2017:98-121.

EDEMA AND MALNUTRITION

Well Nourished	Mild – Moderate Malnutrition	Severe Malnutrition
No fluid accumulation	Mild to moderate pitting (up to 4 mm) that persists for up to 30 seconds	Deep pitting (4-8 mm) lasting greater than 30 seconds

Exam Area: Anterior surface of foot
OR sacral area over posterior pelvis in
non-ambulatory individuals

NFPE Technique: Press on middle to
distal surface of foot for 5 seconds;
observe for pitting



Photo: PHIL, CDC

FUNCTIONAL STATUS

BASELINE ACTIVITY LEVEL

- Ask questions about usual energy and activity levels
- Assess for severity of dysfunction, worsening impairment, and changes in function over previous two weeks
- View changes in comparison with child's own baseline rather than with age-matched peers

DEVELOPMENTAL MILESTONES

- Note developmental delays, but evaluate functional impairment through changes in activity level or regression in skills from child's own baseline

HANDGRIP STRENGTH (HGS)

- Studies in adult populations have found HGS shows an earlier response to nutritional changes than labs or anthropometrics
- Comparative standards for absolute and normalized (grip strength [kg]/weight [kg]) published in 2015 for 6 – 80 years of age based on NHANES 2011-12 data
- HGS does not quantify malnutrition, but changes over time for an individual can be suggestive of improvement or deterioration of nutrition status
- Requires calibrated equipment, trained clinicians, ability of patient to follow directions, and use of age and sex-specific reference data

DEVELOPMENTAL MILESTONES

www.cdc.gov

Age	Developmental Skill
6 months	Mimics sounds, looks at self in mirror, rolls from front to back and back to front, begins to sit unsupported, likes to interact with others, responds to name, babbles vowel sounds (ah, eh, oh), begins to say consonant sounds (m, b), shows curiosity
12 months	Uses and copies simple gestures (shaking head no, waving goodbye), responds to simple spoken requests, can say “mama” and “dada,” pulls to stand, may walk holding onto furniture or stand alone, may show stranger anxiety, has favorite things and people
18 months	Walks independently, drinks from a cup, eats with a spoon, identifies common objects and their uses (phone, spoon), speaks several single words, points to show interest, plays pretend such as feeding a doll, may have temper tantrums, scribbles
2 years	Speaks 2-4 word sentences, shows excitement around other children, follows simple instructions, can kick a ball and stand on tiptoe, identifies objects or pictures by pointing when named, might use one hand more than the other, may show defiant behavior
3 years	Mimics actions of others, converses using 2-3 sentences at a time, climbs, runs, plays make-believe, shows affection, dresses and undresses self, may get upset with changes in routine
4 years	Hops and stands on one foot for up to 2 seconds; pours, cuts with supervision, and mashes own food; tells stories, sings songs, recites simple rhymes, uses “he” and “she” correctly; enjoys playing with other children and can play cooperatively; draws a stick figure; uses scissors
5 years	Speaks clearly, knows name and address, understands real and make-believe, counts 10 or more things, can print some letters or numbers, copies geometric shapes, uses a fork and spoon, can use the bathroom on his/her own, swings and climbs, hops or skips

HEAD-TO-TOE APPROACH

Start at the top and work down:

- Hair
- Eyes
- Mouth (lips, tongue, teeth/gums)
- Temples
- Cheeks
- Chest, shoulders
- Arms, skin, nails
- Ribcage, back, pelvis
- Thighs, knees, calves
- Feet, ankles

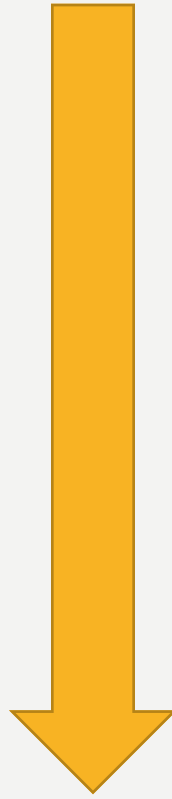


Photo: Holly Van Poots

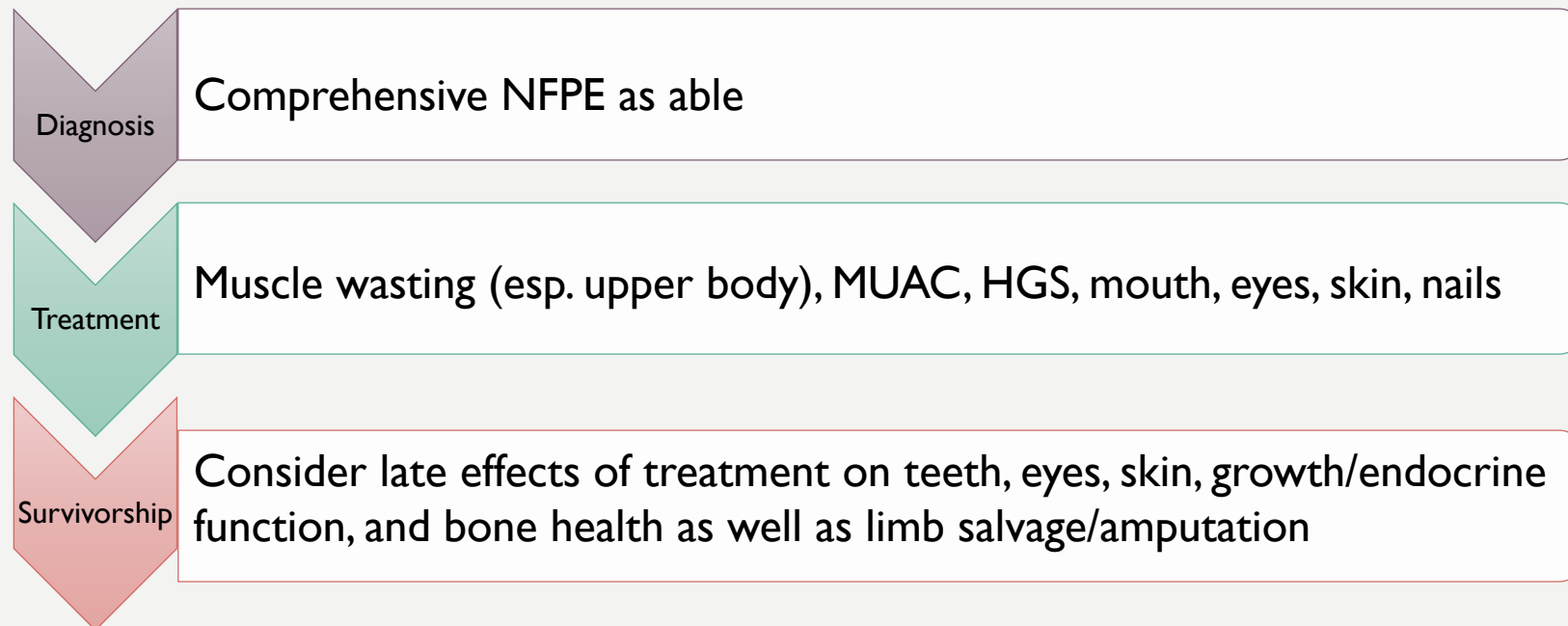
NFPE

Head-to-Toe Demo

Putting It All Together

NFPE FOCUS AREAS FOR THE PEDIATRIC ONCOLOGY POPULATION

- ✓ High-risk subsets by tumor type, treatment modality, and demographics
 - ✓ MUAC as an early and sensitive indicator
 - ✓ Chemotherapy side effects
 - ✓ Timing of interventions



IN CONCLUSION...

Children undergoing cancer treatment are especially vulnerable to the development of illness-related malnutrition

Malnutrition (and overnutrition) are negatively associated with quality of life measures

NFPE can help RDNs to identify the presence of malnutrition sooner, intervene earlier, and minimize deterioration of nutrition status with the goal of improving outcomes

NFPE helps you as the RDN to provide the best possible nutrition care for your patients



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THANK YOU!

QUESTIONS,
COMMENTS,
SUGGESTIONS?

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