Malnutrition (Failure to Thrive) Screening and Management Clinical Pathway

Disclaimer

This clinical pathway is intended to provide general guidance and should not replace clinical judgment. It is meant to assist licensed practitioners and other health care providers in clinical decision-making by describing a range of generally acceptable approaches to the diagnosis and management of a particular condition. A particular patient's circumstances should always be taken into account when a practitioner is deciding on a course of management.This clinical pathway is current as of the date of publication and will be reviewed periodically to align with any updated best practices or evidence; however, new development may notbe represented in the published version. The treating practitioner assumes all risks associated with care decisions. Phoenix Children's accepts no liability for the content of this clinical pathway or the outcomes a patient might experience where a practitioner consulted the content of this clinical pathway.

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Pathway Flow Diagram/Algorithm

The flow diagram should have the key recommendations for clinical management for the medical condition in question. This includes key labs, medications, imaging, and consults recommended. Further details regarding these management recommendations should be located lower down in the article.

Scope

Inclusion Criteria

- Infants and children of all age groups with available weight and length/height measurements where there is a concern for malnutrition.

Exclusion Criteria

- Any patients with previously diagnosed disease process that may be associated with expected growth alterations related to examples may include endocrine, cardiac, genetic, or metabolic syndromes.

Definition: Pediatric malnutrition is the imbalance between nutrient requirement and intake, resulting in cumulative deficits of energy, protein, or micronutrients that may negatively affect growth, development, and other relevant outcomes.

Diagnosis:
When evaluating anthropometrics, z scores are used (rather than percentiles). See example below.

- **Classification:**
  - **Acute:** < 3 months.
  - **Chronic:** ≥ 3 months.

- Pediatric malnutrition indicators based on the child's age group:
  - **Neonatal criteria:** Used for term infants up to 30 days of age, and premature infants up to 44 weeks corrected age. **See Table 1**
    - For the first 2-3 weeks, the primary criteria are nutrient intake and regain of birth weight
    - After 2 weeks of age, can also use decline in weight/age z-score and weight gain velocity as well as nutrient intake
    - Severe malnutrition can be diagnosed with
      - A decline in weight/age z score of >2 SD
      - <25% of expected rate of weight gain to maintain growth
      - ≥7 days of ≤75% of estimated needs
  - **Pediatric criteria:** Use any indicators in **Tables 3 and 4.**
    - Table 3 contains indicators needing only 1 point in time
    - Table 4 contains indicators requiring changes over time
      - Always use the most severe indicator for malnutrition diagnosis
      - A Registered Dietitian (RD) can provide guidance on how to classify the degree of malnutrition
    - Severe malnutrition can be diagnosed with
      - Weight-for-length or BMI z score at or lower than than –3, weight gain less than 25% of expected for age (2 years and younger), weight loss of more than 10% body weight (over age 2 years), and intake 25% of expected or less (See tables 3 and 4 below)

- **Adult criteria:** use criteria **in Table 5**
  - Adult criteria should be used for any patient greater than 20 yr of age
  - Table 5 contains criteria for moderate and severe malnutrition in adults
  - **Must meet at least 2 criteria** to diagnose malnutrition in adults

Table 1: Malnutrition Indicators in Preterm and Neonatal Populations

Malnutrition Indicators in Preterm and Neonatal Populations[1]

Primary Indicators Requiring One Indicator

Indicator	Mild Malnutrition	Moderate Malnutrition	Severe Malnutrition	Use of Indicator
Decline in weight-for-age z score	Decline of 0.8-1.2 SD	Decline of >1.2-2 SD	Decline of >2 SD	Not appropriate for first 2 weeks of life
Weight gain velocity	<75% of expected rate of weight gain to maintain growth rate	<50% of expected rate of weight gain to maintain growth rate	<25% of expected rate of weight gain to maintain growth rate	Not appropriate for first 2 weeks of life
Nutrient intake	≥3-5 consecutive days of protein/energy intake ≤75% of estimated needs	≥5-7 consecutive days of protein/energy intake ≤75% of estimated needs	≥7 consecutive days of protein/energy intake ≤75% of estimated needs	Preferred indicator during first 2 weeks of life

Primary Indicators Requiring Two or More Indicators

Indicator	Mild Malnutrition	Moderate Malnutrition	Severe Malnutrition	Use of Indicator
Days to regain birthweight	15-18	19-21	>21	Use in conjunction with nutrient intake
Linear growth velocity	<75% of expected rate of linear gain to maintain expected growth rate	<50% of expected rate of linear gain to maintain expected growth rate	<25% of expected rate of linear gain to maintain expected growth rate	Not appropriate for first 2 weeks of life May be deferred in critically ill, unstable infants Use in conjunction with another indicator when accurate length measurement available
Decline in length-for-age z score	Decline of 0.8-1.2 SD	Decline of >1.2-2 SD	Decline of >2 SD	Not appropriate for first 2 weeks of life May be deferred in critically ill, unstable infants Use in conjunction with another indicator when accurate length measurement available

Recommended Parenteral and Enteral Energy and Protein Intakes

		Parenteral		Enteral	
Infant Age	Week	Energy Goals (kcal/kg)	Protein Goals (g/kg)	Energy Goals (kcal/kg)	Protein Goals (g/kg)
Preterm	<34-0/7	85-111	3-4	110-130	3.5-4.5
Late Preterm	34-0/7 to 36-6/7	100-110	3-3.5	120-135	3-3.2
Term	≥37-0/7	90-108	2.5-3	105-120	2-2.5

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SD=standard deviation. Expected weight gain velocity, expected linear growth velocity, and z scores can be determined using the online calculator PediTools (www.peditools.org).

Reference: 1. Reprinted from *Journal of the Academy of Nutrition and Dietetics*, Goldberg DL, Becker PJ, Brigham K, et al. Author(s), Identifying Malnutrition in Preterm and Neonatal Populations: Recommended Indicators. Article in Press https://doi.org/10.1016/j.jand.2017.10.006 Pages 1-11, 2018, with permission from Elsevier and Academy of Nutrition and Dietetics.

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Table 3. Primary Indicators When Single Data Point Available.[71-74,76,77]

	Mild Malnutrition	Moderate Malnutrition	Severe Malnutrition
Weight-for-height *z* score	−1 to −1.9 *z* score	−2 to −2.9 *z* score	−3 or greater *z* score
BMI-for-age *z* score	−1 to −1.9 *z* score	−2 to −2.9 *z* score	−3 or greater *z* score
Length/height-for-age *z* score	No data	No data	−3 *z* score
Mid–upper arm circumference	Greater than or equal to −1 to −1.9 *z* score	Greater than or equal to −2 to −2.9 *z* score	Greater than or equal to −3 *z* score

BMI, body mass index.

Table 4. Primary Indicators When 2 or More Data Points Available.[71-74,76,77]

	Mild Malnutrition	Moderate Malnutrition	Severe Malnutrition
Weight gain velocity (<2 years of age)	Less than 75%[a] of the norm[b] for expected weight gain	Less than 50%[a] of the norm[b] for expected weight gain	Less than 25%[a] of the norm[b] for expected weight gain
Weight loss (2–20 years of age)	5% usual body weight	7.5% usual body weight	10% usual body weight
Deceleration in weight for length/height *z* score	Decline of 1 *z* score	Decline of 2 *z* score	Decline of 3 *z* score
Inadequate nutrient intake	51%–75% estimated energy/protein need	26%–50% estimated energy/protein need	≤25% estimated energy/protein need

[a]Guo S, Roche AF, Foman SJ, et al. Reference data on gains in weight and length during the first two years of life. *Pediatrics*. 1991;119(3):355-362.
[b]World Health Organization data for patients <2 years old: http://www.who.int/childgrowth/standards/w_velocity/en/index.html.

Table 5: Adult Malnutrition Criteria

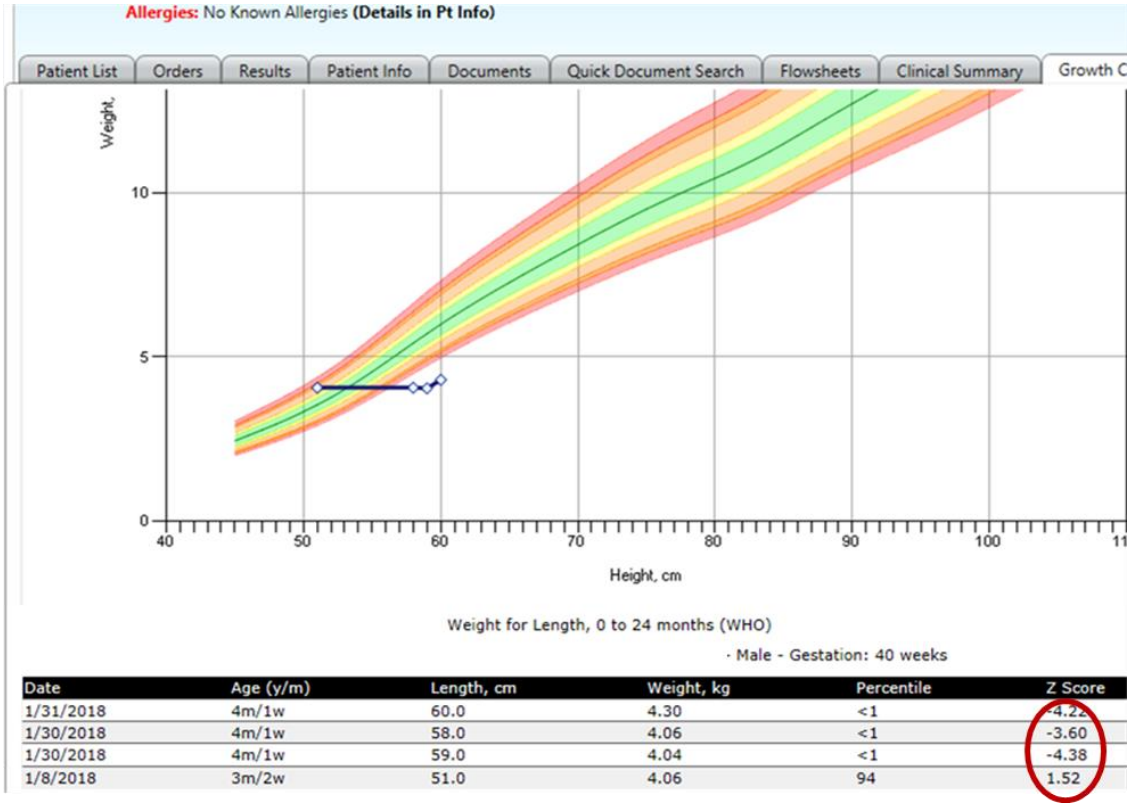
Two factors in the table below must be present for a malnutrition diagnosis.

	Acute Illness or Injury		Chronic Illness		Social or Environmental Factors	
	Moderate Protein Calorie Malnutrition	**Severe Protein Calorie Malnutrition**	**Moderate Protein Calorie Malnutrition**	**Severe Protein Calorie Malnutrition**	**Moderate Protein Calorie Malnutrition**	**Severe Protein Calorie Malnutrition**
Energy Intake	<75% of EEE >7 days	≤50 % of EEE >5 days	<75% of EEE ≥1 month	<75% of EEE ≥1 month	<75% of EEE ≥3 months	≤50% of EEE ≥1 month
Weight Loss	1–2% 1 week 5% 1 month 7.5% 3 months	>2% 1 week >5% 1 month >7.5% 3 months	5% 1 month 7.5% 3 months 10% 6 months 20% 1 year	>5% 1 months >7.5% 3 months >10% 6 months >20% 1 year	>5% 1 month >7.5% 3 months >10% 6 months >20% 1 year	> 5% 1 month >7.5% 3 months >10% 6 months > 20% 1 year
Body Fat Loss	Mild	Moderate	Mild	Severe	Mild	Severe
Muscle Mass Wasting	Mild	Moderate	Mild	Severe	Mild	Severe
Fluid (Edema)	Mild	Moderate to Severe	Mild	Moderate to Severe	Mild	Moderate to Severe
Hand Grip Strength	N/A	Measurably Reduced	N/A	Measurably Reduced	N/A	Measurably Reduced

EEE: Estimated energy expenditure N/A: Not applicable
Reference: Academy of Nutrition and Dietetics & American Society of Parenteral and Enteral Nutrition Clinical Characteristics Malnutrition 2011.

- **Z-score:** There are three different systems by which a child or a group of children can be compared to the reference population: Z-scores (standard deviation scores), percentiles, and percent of median. For population-based assessment—including surveys and nutritional surveillance—the Z-score is widely recognized as the best system for analysis and presentation of anthropometric data because of its advantages compared to the other methods.

Example:



Date	Age (y/m)	Length, cm	Weight, kg	Percentile	Z Score
1/31/2018	4m/1w	60.0	4.30	<1	-4.22
1/30/2018	4m/1w	58.0	4.06	<1	-3.60
1/30/2018	4m/1w	59.0	4.04	<1	-4.38
1/8/2018	3m/2w	51.0	4.06	94	1.52

For this particular example, when plotting weight for length on this 4-month-old male infant his Z-score on 1/31 was > -4 standard deviations from the 50th percentile, which meets criteria for severe malnutrition.

Pathway Goals

The goal of this pathway is to standardize the definition and approach of patients identified to have malnutrition on children presenting to Phoenix Children's Hospital (PCH) or Phoenix Children's Care Network (PCCN) facility.

Key Clinical Recommendations with Evidence Based Supporting Material

1. Methods to obtain anthropometric measurements.
    A. Obtain anthropometric measurements:
        a. **Children younger than 2 years of age**,
            i. Check weight without the diaper/clothes/shoes.
            ii. Check length (laying down, recommend use of infant/toddler length board).
            iii. Add measurement to growth chart. Medical record defaults to (WHO) sex specific growth chart.
            iv. If preterm, adjust for corrected gestational age.
            v. Use Fenton Growth Chart until 44 weeks corrected age.
        b. **Children 2 years of age or older**
            i. Measure height (standing) and weight (no shoes, minimal clothing)
            ii. Add measurement to growth chart. Medical record defaults to (CDC) sex specific growth chart.
            iii. Utilize BMI z-score.

2. Children with special healthcare needs with specific growth charts.
    A. If any of the following conditions, consider plotting on specific growth chart as an additional resource to make a decision. Be aware that many of these charts do not have separate BMI charts associated with them.
        - Achondroplasia
        - Amyoplasia
        - Cerebral palsy
        - Cri du Chat syndrome
        - De Lange syndrome
        - Diastrophic dysplasia
        - Down syndrome
        - Fragile X syndrome
        - Myelomeningocele
        - Noonan syndrome
        - Prader-Willi syndrome
        - Pseudoachondroplasia
        - Quadriplegic cerebral palsy
        - Rubinstein-Taybi
        - SED (SpondyloEpiphyseal Dysplasia)
        - Trisomy 13
        - Trisomy 18
        - William's syndrome

3. Obtain a complete history that includes:
    A. Dietary history:

- **If breastfeeding:**
    - How long/how often?
    - Is the child breastfeeding through the night?
    - Formula supplementation? How much and how often?
    - Vitamin/iron supplementation?
    - What is the child's behavior during breastfeeding: coughing, fussy, sleepy?
    - What is the child's tolerance: choking, gagging?
    - Number of wet and soiled diapers.
    - Does the mother hear swallowing?
    - Is mother having nipple pain?
- **If formula feeding:**
    - Type of formula patient is currently taking.
        - History of formulas tried
    - How much and how often? (e.g. 3 ounces q3hr)
    - Does the child sleep for longer periods of time day or night?
    - How much and how often?
    - Cereal added to the formula?
    - Vitamin/iron supplementation?
    - Mixing instructions for formula to determine calorie concentration
    - Tolerance of formula (diarrhea/constipation/emesis, choking, gagging)
    - Number of wet and soiled diapers.
- **If drinking regular cow milk**:
    - Type (cow, soy, almond, rice, goat, etc).
        - If cow milk: what fat %
    - How often and how much?
    - Any additives?
    - Tolerance: vomiting, bloating, diarrhea, abdominal distention
- **Solids**:
    - Age solids introduced, type/portion size and frequency.
    - Tolerance: diarrhea, vomiting, choking, gagging
    - Picky/Problem eater?
- **Enteral Feeding patient:**
    - Feeding regimen –Type of formula, rate/hours, number of boluses per day, night drip?
    - Mixing instructions if applicable
    - Tolerance (diarrhea/constipation/emesis)
    - Any holding of feeds? Average volume patient receives.
    - Any food/drink by mouth
    - Water flushes?

B. Birth history with gestational age, complications during pregnancy and birth weight. If the child is younger than 2 years of age, recommend to include maternal age, number of pregnancies, maternal medical conditions during pregnancy and pre and post-natal complications.

C. Developmental history: gross, fine motor as well as social/ verbal skills.

D. Family history: maternal depression, IBD, celiac disease and other GI and/or, genetic conditions, etc.

E. Social history: Who lives at home with child (adults and children, relationship to the child, who is the primary care giver, if the child attends daycare? For more details of a complete social history, please refer to PCH 10139 Form (Failure to Thrive Social Work Assessment) located on InDex intranet. Consult Social Work for more complete assessment.

4. Perform a physical exam with special attention to birth marks, abnormalities on heart sounds, signs of sexual development, and signs of neglect or physical abuse.
5. Laboratory tests and/or imaging should only be ordered based on individual clinical circumstances with suggestive historic or clinical findings such as refusal to swallow, vomiting, diarrhea, dehydration, family history.
6. Admission is not generally required for the evaluation of patients with malnutrition unless the child has one of the admission criteria listed below. If the patient has one of the admission criteria listed below, please refer for direct admit to PCH One Call Admission Center 602-933-DOCS or 602-3627. Referral to the ED is not recommended.
7. Recommend to refer to gastroenterology if patient not gaining weight despite appropriate nutritional management.

Admission Criteria

The following is recommended but not limited to criteria for admission:

1. Failure of outpatient treatment:
    - Insufficient improvement (or worsening) of signs or symptoms despite adherence to appropriate outpatient regimen of sufficient duration.
    - Inability to adequately adhere to appropriate outpatient regimen (eg, vomiting, altered mental status, inadequate outpatient or caregiver support).
    - Inability to tolerate outpatient regimen (eg, severe side effects, allergy)
2. Suspected abuse or severe neglect (health care professional please communicate reasons for concern)
3. Inpatient-level observation of psychosocial interaction between child and caregivers deemed necessary (health care professional please communicate reasons for concern and/or rationale).
4. Meets criteria for severe malnutrition.
5. Infants (especially those younger than 29 days) with significant feeding problem (inadequate oral intake or weight gain, meeting criteria for moderate or severe malnutrition)
6. Medical instability indicated by 1 or more of the following:
    - Hypothermia: core (eg, rectal) body temperature less than or equal to 95 degrees F (35 degrees C).
    - Bradycardia
    - Hypotension
    - Significant electrolyte abnormality (eg, hyponatremia, hypokalemia, hypernatremia).

Discharge Criteria

1. Patient tolerating dietary management.
2. Demonstration of adequate weight gain. Example: at least 3 days of adequate weight gain
3. Follow up appointment arranged to follow up with Primary Care Practitioner.
4. If DCS involved, clearance for disposition once patient is medically cleared for discharge.
5. Discharge checklist (below) included in the discharge instructions for the parent/legal guardian:
    - A clear feeding plan
    - When the child is to be weighed, by whom and frequency
    - Outpatient follow up(s). To be clear as to when and to whom
    - A clear statement of actions with time limits and a named person responsible for actions

Patient and Family Education/Discharge Planning

Breast Milk and Formula recipes can be found in InDEx under Patient and Family Education - Nutrition

Feeding problems – behavioral intervention resources for parents

- Recommend to the parent/guardian to complete a simple, quick questionnaire at home or in the office, the link is: http://questionnaire.feedingmatters.org/questionnaire
    - If the parent/guardian or provider would like additional support or information, please contact Feeding Matters at 623-242-5234. If outside of the state of Arizona, please call 1-800-233-4658
- Other educational resources:
    - https://www.webmd.com/parenting/features/solutions-for-toddler-eating-problems#3
    - https://www.ellynsatterinstitute.org/how-to-feed/
    - https://www.eatright.org/health/wellness/weight-and-body-positivity/safe-weight-gain-tips-for-underweight-kids

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