



Failure to Thrive/ Malnutrition

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Definition

Failure to thrive (FTT) refers to a lack of growth or weight gain in a child under 3 years old when compared to the expected weight gain for a child of their age and sex. While FTT can be used to describe children with both organic and non-organic causes of poor growth, the term, “Early Pediatric Malnutrition” has been proposed as a more accurate and less pejorative diagnosis for children with poor growth due to inadequate caloric intake, which is the most common cause of FTT.

FTT/Malnutrition has a general definition, but several distinct measurements have been used by different groups to create more distinct definitions. These include weight below the 5th percentile for age and sex on two separate occasions, weight that drops more than two major percentiles, and weight less than 80% of the median weight-for-length or below the 5th percentile for weight-for-length. Difficulties arise with these measurements, as several require a weight trend, while sometimes, healthy children fall at the lower limits of the growth curves but are still within the “normal” range. It is important to use the most appropriate growth chart for a patient, considering genetic syndromes and correcting postnatal age for prematurity. It is also important to recognize that some healthy infants are born above expected weight and will experience an initial fall below birth centiles over the first 6-12 months before following their “correct” percentiles, also known as “regression to the mean” or “catch down” growth.

Epidemiology

Growth Data from 2010 on US children <5 years of age who are enrolled in public assistance programs (such as WIC) indicate that 4.5% of the children are underweight (weight-for-age <5th percentile) and 5.9% are stunted (length-for-age <5th percentile). Although FTT/malnutrition is more common among infants from low-income families than from middle income families, it occurs in all segments of the population. Poverty can affect children directly through lack of food, health care, and adequate educational opportunities. It can also affect children indirectly through increased family stress, which may interfere with parents' ability to provide nutritious meals on a regular basis or in a nurturing manner. Food insecurity has been associated with hospitalizations, poor health, and developmental risk among infants, and with developmental, academic, and learning problems among school-age children. Children can experience poor growth in homes of any social class in cases of parent-child interactive disorders, parental psychopathology, family dysfunction, or organic pathology. The impact of such problems increases in the context of poverty.

Etiology

Etiology of early childhood malnutrition is due to inadequate intake of calories and nutrients to support adequate growth, increased caloric demand and expenditure, and/or loss of calories and nutrients or inefficient utilization of calories.

Differential Diagnosis

Alternate diagnoses associated with low weight:

1. Small but healthy: These are normal children who track below the 5th% on growth charts.
2. Small for gestational age: These are children who had compromised growth in utero and continued to have poor growth postnatally typically across all growth parameters (symmetrical growth retardation).
3. Prematurity: These children were born prematurely and demonstrate postnatal growth which appears poor when plotted on the normal growth charts but is appropriate when plotted using their post-gestational age. Very low birth weight infants (those born <1500 gm) were not included in the CDC growth chart reference data because their growth patterns are markedly different than term infants weighing more than 2500 gm and more closely follow the pattern of growth of the IHDP (VLBW Infant Health and Development Program chart). It is most important to use the gestation-adjusted age at birth to plot these infants up to 24 months of age.

Methods

Existing External Guidelines/Clinical Pathways

Existing External Guideline/Clinical Pathway	Organization and Author	Last Update
Faltering Growth V1.0 Direct Admission and ED management	Seattle Children's Hospital	Dec 2018
Failure to Thrive Clinical Practice Guideline	Children's Mercy Hospitals and Clinics The Office of Evidence Based Practice	2012
Management of Failure to Thrive	Texas Children's Hospital Evidence-Based Outcomes Center	May 2018

Any published clinical guidelines have been evaluated for this review using the **AGREE II criteria**. The comparisons of these guidelines are found at the end of this document. **AGREE II criteria** include evaluation of: Guideline Scope and Purpose, Stakeholder Involvement, Rigor of Development, Clarity of Presentation, Applicability, and Editorial Independence.

Evidence Found with Searches

Check Type of Evidence Found	Summary of Evidence – All Questions	Number of Articles Obtained
<input checked="" type="checkbox"/>	Systematic Reviews	2
<input checked="" type="checkbox"/>	Meta-analysis articles	1
<input type="checkbox"/>	Randomized Controlled Trials	
<input checked="" type="checkbox"/>	Non-randomized studies	6
<input checked="" type="checkbox"/>	Review articles	4
<input type="checkbox"/>	Government/State agency regulations	
<input checked="" type="checkbox"/>	Professional organization guidelines, white papers, ect.	8
<input checked="" type="checkbox"/>	Other: Case Study	1

Diagnostic Evaluation

Severity

It is not always necessary to hospitalize children when there is concern for Failure to thrive. Often, several services including speech therapy, occupational therapy, nutrition, and social work among others can be obtained outpatient. However, it may not be feasible for families to obtain all these services as an outpatient due to psychosocial, environmental, or monetary issues, which is when it may become pertinent to undergo evaluation in the hospital. Additionally, if it cannot be determined that malnutrition is the cause of a patient's growth failure, then inpatient work-up would be pertinent.

The severity of malnutrition may affect the choice to admit a patient as well. The Z score is a way to delineate degrees of malnutrition, which refers to the number of standard deviations from the weight norm: Z score < -3 signifying severe malnutrition, between -2 and -3 signifying moderate malnutrition, and < -1 signifying mild malnutrition. Therefore, patients with a z score showing moderate or severe malnutrition would be more likely to be hospitalized for under-nutrition. This is especially true in patients with higher numbers of comorbidities associated with their malnutrition including dehydration or iron-deficiency anemia. Peditools.org can be used to plot growth parameters for all patients and obtain accurate Z-scores.

Inpatient Workup

Perhaps the most important aspect of working up a young patient with malnutrition is the history. It is important to gather a very detailed history, paying especially close attention to formula preparation (if formula fed), feeding routine and behavior (how does the child feed, does he/she sweat profusely when feeding?), and schedule. Moreover, a thorough history on development, birth history and growth parameters, NICU stay, and problems with pregnancy is crucial. A social history is also very important as this plays a major role in most patients with FTT/malnutrition. For example, where the patient lives, who the patient lives and/or spends time with, family violence, feeding and nutrition beliefs, and financial stressors and food insecurity. Other pertinent information to obtain on history would be history of illnesses, family history of illnesses (psychiatric especially), and a thorough review of systems.

On physical exam, pay close attention to dysmorphic features that would tie to any metabolic/genetic disorders. Overall appearance of wasting, muscle mass, hypotonia, listlessness is a very important first step to determine the patient's severity of illness. Look for cleft lip/palate, or tongue tie that may prevent a good latch to the breast or bottle. Listen for murmurs on heart exam and uneven pulses in upper and lower extremities that would lead to a diagnosis of congenital heart disease. Lung exam is not diagnostic for diseases such as cystic fibrosis, but if abnormalities are auscultated, CF should always be on the differential. A good palpation of the abdomen can rule out hepatosplenomegaly. Skin exam often can reflect deficiencies in vitamins, minerals and electrolytes such as Zinc, Copper, Vitamin C, etc. Lastly, pay close attention to the patient-caregiver interaction.

No standard sets of labs are recommended for Failure to thrive patients and are only needed on a case-by-case basis. For instance, patients that appear extremely cachectic, dehydrated, or listless on exam may warrant a CBC and CMP to look for anemia, electrolyte abnormalities. Concerns for physical abuse may lead to a skeletal survey, LFTs, UA. A history of frequent diarrhea or malodorous stools could lead one to obtain a celiac, malabsorption, and CF workup. One should always obtain a UA if there is concern for infection.

Recognition of FTT/Malnutrition secondary to Neglect or Abuse

Child neglect is among the many causes of FTT/malnutrition and should be considered by the multidisciplinary team. Cases of FTT which do not resolve with appropriate interventions should be reported to child protection agencies, with very close follow up arranged at discharge including establishing a written caregiver contract to define and monitor compliance. These risk factors should alert the provider to the possibility of abuse or neglect as a cause:

- Parental depression, stress, marital strife, psychological or intellectual abnormalities
- Parental history of abuse as a child or previous child abuse in the family
- Domestic violence
- Young or single parent lacking social support
- Social isolation, poverty, or parents overly focused outside the home
- Resistance or failure to adhere to medical regimens, strong belief in unusual health/nutrition regimens
- Lack of knowledge of normal child growth and development
- Infant with low birth weight or prolonged hospitalization

Clinical Management

Inpatient management

The most important inpatient management is observation of the feeding process between the parent/caregiver and the patient. A nurse should witness the caregiver obtaining supplies, mixing and preparing the formula (if applicable), feeding the patient, and interaction between caregiver and patient during the feeding process. Social worker, dietitian, and lactation consultant (if breastfed) should be consulted in almost every instance. Speech therapy consultation would be required if there are concerns for aspiration and swallowing dysfunction and occupational therapy consultation if concerns with oromotor function, food texture, hunger cues. Nursing orders consist of vital signs, weights once a day without clothes and before feeds, scheduled mealtimes (at least one observation described above per shift), and parental teach-back. Subspecialists should be consulted if there are concerns for underlying pathology such as Endocrine for GH deficiency, Gastroenterology for Celiac, malabsorption, Pulmonology for CF, Infectious disease for HIV, TB, etc., CARE team for abuse/neglect, and psychology for parental depression/stressors or behavioral abnormalities. If patient has difficulty with feeding by mouth, sometimes nasogastric tube feeds may be warranted to demonstrate appropriate weight gain as a means of confirming oromotor pathology.

Complications of Failure to Thrive

Refeeding syndrome is a potential short-term complication of malnutrition. However, evidence suggests that uncomplicated patients age 0-6 months with malnutrition have a low risk of refeeding syndrome. In contrast, children with severe chronic weight loss (such as from anorexia nervosa, cancer cachexia, post-op patients, chronic malabsorption syndromes, or chronic malnutrition) are at highest risk of refeeding syndrome especially during the first 4-7 days after restarting feeds, but even up to 2 weeks after restarting nutrition. Some other risk factors for refeeding syndrome include patients with a BMI <5th percentile for age, acute weight loss of 5-10% in the past 1-2 months, no enteral nutrition for 7-10 days or major stressors without food for several days, abnormal electrolytes (phosphate, potassium, magnesium) prior to refeeding, prolonged and severe vomiting, prolonged QTc on EKG, and/or pre-existing cardiac or respiratory conditions. Even though the pathogenesis of refeeding syndrome is not fully understood, electrolytes changes (low phosphate, magnesium, potassium levels), fluid balance disruptions, impaired heart function and hypoglycemia with abnormal intracellular energy production play a role. Thus, to avoid refeeding syndrome in severely malnourished children, slowly increase food intake and give phosphate, magnesium, and potassium supplements.

Long term complications of FTT/malnutrition include a higher incidence of developmental delay, slightly lower IQ than expected, some persistent reduction in weight and height later in childhood, learning difficulties, and behavior difficulties. The psychosocial environmental problems that often contribute to malnutrition may also impair children's development. Of note, infants with iron deficiency anemia have measurably worse developmental and behavioral outcomes 10 years later despite appropriate treatment at time of diagnosis. Overall prognosis of FTT/early pediatric malnutrition is good, with adverse effects of malnutrition on cognitive function appearing to diminish over time and no association with adverse emotional development in childhood. By school age, most children have normal weight but may continue to be shorter than age-matched peers. There have also been reported risks of developing metabolic syndrome later in life if clinicians overcorrect growth patterns.

Discharge and Follow up

Discharge Criteria consist of the following:

- Patient medically stable with appropriate fluid/caloric intake and stable/improved weight
- Labs/imaging/consult recommendations appropriate for outpatient management
- Caregiver interaction and care is appropriate and concerns adequately addressed
- Caregiver demonstrates understanding of nutrition recommendations and growth expectations and understands discharge plan/education

Follow up visits should be established weekly for infants to monthly for older children and as weight gain occurs regularly. Successful treatment as demonstrated by accelerated growth must be maintained for four to nine months to resolve undernutrition and achieve appropriate weight for height. Weight for height measurements above the 10th percentile with normal weight gain on two evaluations at least one month apart are reassuring for successful treatment.

INCLUSION CRITERIA

All patients with a concern for Malnutrition will be evaluated by Attending Pediatrician for **inclusion** under this guideline:

- Child <24 months old, and
- No underlying disorder (GI, metabolic, endocrine, genetic, prematurity) which is currently *untreated*, and
- Patient *cannot* be managed as an outpatient (medically unstable, moderate or severe dehydration *or* malnutrition*, suspected abuse/neglect, concerns for parent-child interaction, risk for loss of follow up)
- Friday admission avoided if possible

Primary Team:

- Admit using *Failure to Thrive Order Set*
- Detailed history & PE including home feeding regimen
- Obtain and evaluate medical records & growth charts from PCP
- Obtain labs *only* where clinically indicated
- Classify degree of malnutrition for treatment and coding purposes

Multidisciplinary Approach to determine nutritional status and needs:

- *Dietician consult +/- Lactation* (if breast fed)
- *Nursing* observation of at least one feed per day (including formula preparation using powder, caregiver interaction, feeding tolerance)
- *Social Work consult* for full psychosocial assessment

Severe malnutrition: Use modified WHO feeding protocol per Dietary guideline to prevent refeeding syndrome

Consider early consultation:

- *OT consult* if concerns about feeding technique and/or oral-motor function
- *ST consult* if concerns about swallowing
- *CARE team consult* if concerns for abuse, neglect, or follow-up compliance

Discharge Criteria:

- Appropriate intake with weight gain over ≥ 3 days without assistance of IVF or TPN.
- Social concerns addressed including caregiver availability and knowledge.
- Arrangements made for obtaining formula after discharge and providing enough formula until WIC appt.
- Written instructions/visual aid for all feeding expectations provided to caregivers.
- Follow up appointments established (PCP, +/- ECI, +/- CARE clinic, +/- WIC) including visit and weight check frequency sent to PCP/CARE.
- Consider multidisciplinary team conference with family +/- signed care contract.

***Severe Malnutrition Criteria:**

Single data point:
Wt for Length, Length or BMI
z-score ≤ 3

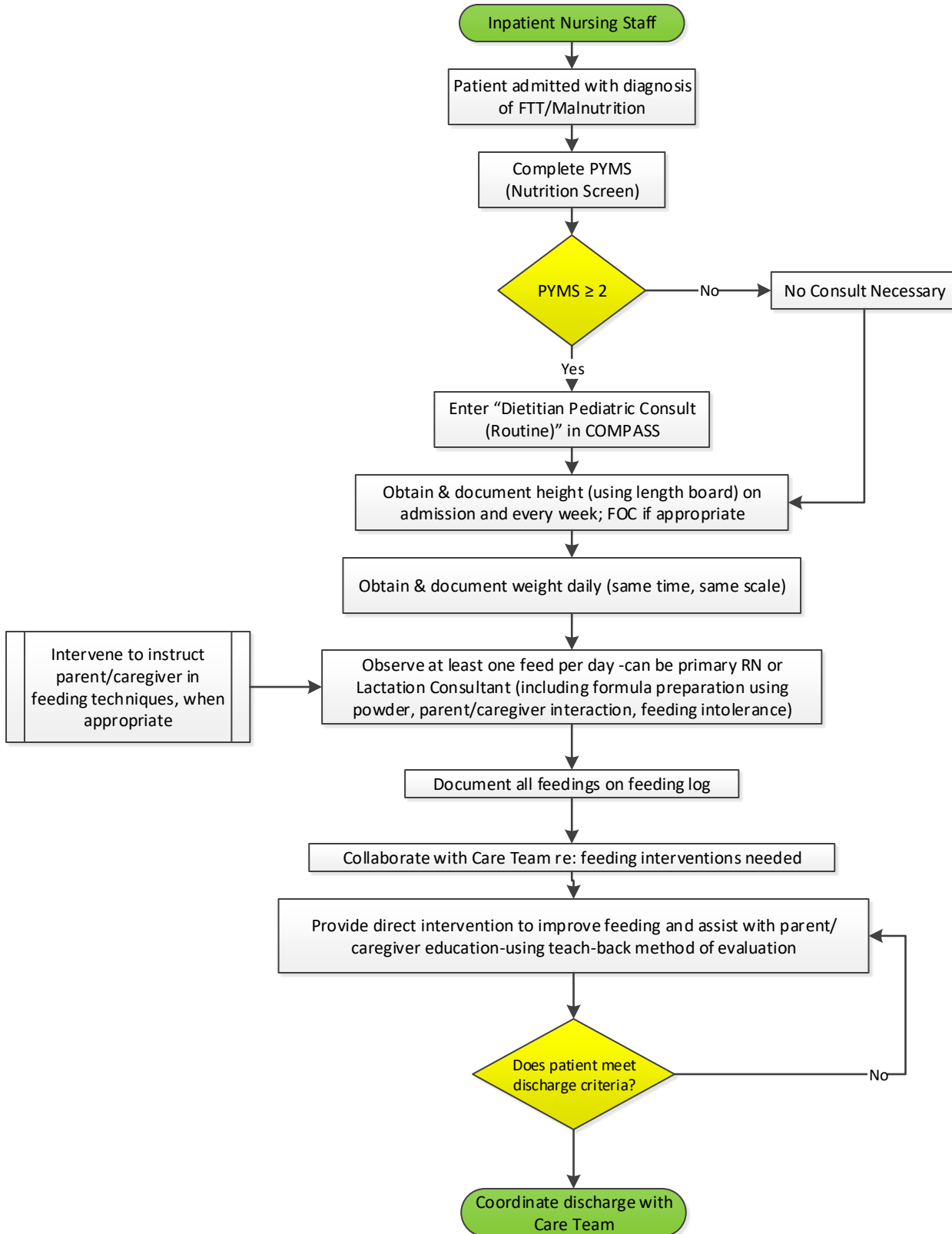
Multi data point (2or+):
Wt gain velocity <25% of norm
for age

Decrease in Wt for L or BMI
z-score of ≥ 3

$\leq 25\%$ est Energy/protein needs
for at least 2 wks

Both fat loss and muscle wasting
seen

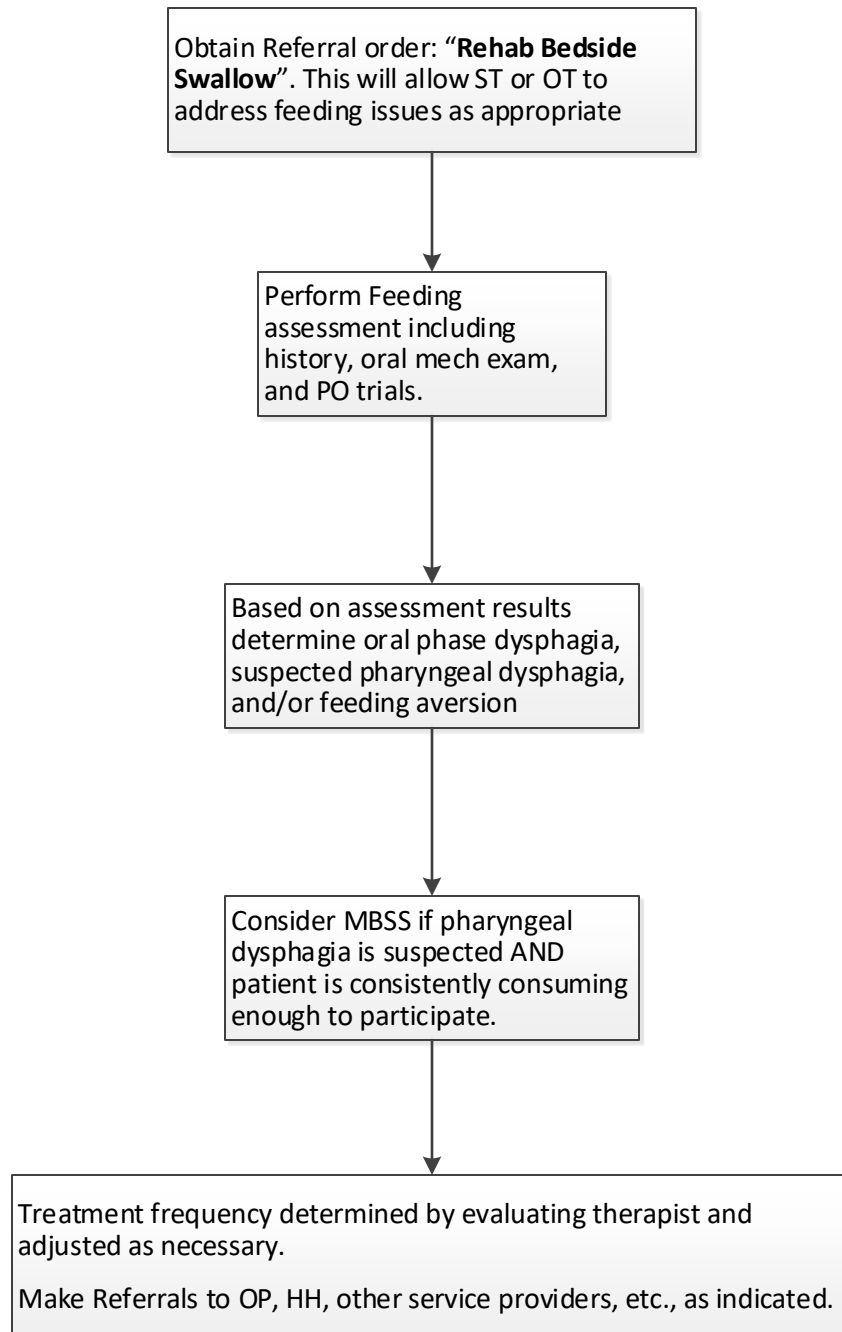
Peditools.org can be used to plot growth parameters for all patients and obtain accurate Z-scores.
WHO Child Growth Standards



- Household/family make-up
- All known caregivers for patient (including their age, availability, feeding responsibilities, work schedules, etc.) and their availability for inpatient feedings
- Childcare setting and schedule, food provided and consumed in that setting
- PCP and any specialists
- Employment/insurance/state assistance such as WIC and SNAP
- Any concrete needs not currently being addressed (transportation, housing, food, childcare, etc.)
- Assessment of any learning differences or literacy concerns for the parent (including vision or hearing needs) and any unusual health beliefs
- Assessment of any other special needs of the parent (healthcare needs, current medications that might be pertinent)
- Other psychosocial risk factors: PPD and other MH history, household conflict or DV/IPV, previous CPS or legal involvement, substance abuse issues, support system, other environmental stressors, any concerns for parental knowledge of patient's condition

- General feeding routine, to include: type of formula, how it's mixed, how often given (including at night), and if there are any challenges with *any* of this (waking the patient up, parent waking up themselves, taking feeding cues from patient, etc.).
- Other info about patient's daily routine (sleeping arrangements, sleep schedules, etc.)
- Assessment of patient/caregiver interactions/attachment

- Consider need for 24 room-in if caregiver(s) not available for majority of inpatient feeds and/or for knowledge concerns
- Consider need for MDT conference with family and/or family to sign written plan of care contract prior to hospital discharge



Executive Summary

Approved by the Pediatric Evidence-Based Outcomes Center Team

Revision History

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Next Review Date: July 2024

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Recommendations

Practice recommendations were directed by the existing evidence and consensus amongst the content experts. Patient and family preferences were included when possible.

Approval Process

EBOC guidelines are reviewed by DCMC content experts, the EBOC committee, and are subject to a hospital wide review prior to implementation. Recommendations are reviewed and adjusted based on local expertise.

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