Course 3: Management of malnutrition

- 🕒: 4 hrs 30 min
- 📚: National Guidelines for integrated management of acute malnutrition
- 📔: Power point handouts
- 🕔: Case studies: Management of malnutrition: OTP and in patient care
- 📖: Reductive adaptation notes
MANAGEMENT OF MALNUTRITION

• Content overview
  – definitions
  – pathophysiology of malnutrition
  – causes of malnutrition
  – categories of malnutrition
  – diagnosis of acute malnutrition
  – nutrition education and counseling
  – nutrient–based interventions
Objective

• To equip health service providers with knowledge and skills through:
  – enhancing understanding on best practices
  – prevention of malnutrition by early identification
  – Effective management of malnutrition in order to improve treatment outcomes including morbidity and mortality
Course 3a: Introduction to Management of acute malnutrition
Definitions

• **Malnutrition** is defined as any nutritional disorder. It may result from an unbalanced, insufficient, or excessive diet or from impaired absorption, assimilation, or use of foods.

• **Over-nutrition** – a condition of excess nutrient and energy intake over time. Over nutrition may be regarded as a form of malnutrition when it leads to morbid obesity.

• **Obesity** – an abnormal increase in the proportion of fat cells, mainly in the visceral and subcutaneous tissues of the body.

• **Under-nutrition** – malnutrition caused by an inadequate food supply or an inability to use the nutrients in food.
Continued...

- **Oedema** – the abnormal accumulation of fluid in the interstitial spaces of tissues such as the pericardial sac, intrapleural sac, peritoneal cavity, or joint capsules.
- **Food security** refers to physical and economic access to food of sufficient quality and quantity
- **Nutrition security** refers to secure access to food coupled with sanitary environment, adequate health services, and knowledgeable care to ensure healthy life.
- **Z score** – a normalized value created from a member of a set of data by expressing it in terms of standard deviations from the median.
Causes of malnutrition

- **Food:** Inadequate household food security (limited access or availability of food)
- **Nutrition:** Inadequate access to food coupled with unsanitary environment, inadequate health services, and lack of knowledgeable care to ensure healthy life.
- **Health:** Limited access to adequate health services and/or inadequate environmental health conditions.
- **Care:** Inadequate social and care environment in the household and local community, especially in regard to women and children.
Conceptual framework of malnutrition (UNICEF 1991)
Pathophysiology of Undernutrition

Reductive adaptation

Reductive adaptation is defined as the physiological response of the body to undernutrition i.e. Systems slow down and do less in severe acute undernutrition in order to allow survival on limited nutrient resources especially calories.
Pathophysiology of undernutrition

- reduced cellular metabolism
- reduction of protein/enzymes synthesis
- reduced cardiac output
- reduced kidney function - Limited capacity of excretion,
- Electrolyte imbalance - Concentration K+ ↓; Na+ ↑
- Iron - anaemia
- low transferrin
- Immune system-Inflammatory responses absent or severely weakened
- Thermoregulation altered; poikilothermia: hypothermia/pyrexia

Diagram showing:
- Inadequate protein and/or energy intake leading to:
  - Reduced protein store
  - Reduced metabolic rate
  - Adaptive mechanisms
  - Successful adaptation:
    - Zero protein and energy balance
    - Normal serum albumin
  - Failed adaptation:
    - Continuing protein and fat loss
    - Hypalbuminemia
    - Immune deficiency
  - Death
INTRODUCTION TO PATHOPHYSIOLOGY OF MALNUTRITION
PHYSIOLOGICAL BASIS FOR TREATMENT OF MALNUTRITION
Cardiovascular system (1)

- Cardiac output and stroke volume are reduced
- Infusion of saline may cause an increase in venous pressure
- Any increase in blood volume can easily produce acute heart failure;
- Any decrease will further compromise tissue perfusion
Cardiovascular system (2):

• Blood pressure is low
• Renal perfusion and circulation time are reduced
• Plasma volume is usually normal and red cell volume is reduced
LIVER (1)

• Synthesis of all proteins is reduced
• Abnormal metabolites of amino acids are produced
• Capacity of liver to take up, metabolize and excrete toxins is severely reduced
• Energy production from substrates such as galactose and fructose is much slower than normal
LIVER (2)

- Gluconeogenesis is reduced, which increases the risk of hypoglycaemia during infection
- Bile secretion is reduced
GENITOURINARY SYSTEM (1)

• Glomerular filtration is reduced
• Capacity of kidney to excrete excess acid or a water load is greatly reduced
• Urinary phosphate output is low
• Sodium excretion is reduced
• Urinary tract infection is common.
GASTROINTESTINAL SYSTEM (2)

- Production of gastric acid is reduced
- Intestinal motility is reduced
- Pancreas is atrophied and production of digestive enzymes is reduced
- Small intestinal mucosa is atrophied; secretion of digestive enzymes is reduced
- Absorption of nutrients is reduced
IMMUNE SYSTEM (1)

- All aspects of immunity are diminished
- Lymph glands, tonsils and the thymus are atrophied
  - Cell-mediated (T-cell) immunity is severely depressed
- IgA levels in secretions are reduced
- Complement components are low
- Phagocytes do not kill ingested bacteria efficiently
IMMUNE SYSTEM (2)

- Tissue damage does not result in inflammation or migration of white cells to the affected area
- Acute phase immune response is diminished
- Typical signs of infection, such as an increased white cell count and fever, are frequently absent
- Hypoglycaemia and hypothermia are both signs of severe infection and are usually associated with septic shock
ENDOCRINE SYSTEM

- Insulin levels are reduced and the child has glucose intolerance
- Insulin growth factor 1 (IGF-1) levels are reduced
- Growth hormone levels are increased
- Cortisol levels are usually increased
CIRCULATORY SYSTEM

- Basic metabolic rate is reduced by about 30%.
- Energy expenditure due to activity is very low.
- Both heat generation and heat loss are impaired; the child becomes hypothermic in a cold environment and hyperthermic in a hot environment.
CELLULAR FUNCTION

• Sodium pump activity is reduced and cell membranes are more permeable than normal, which leads to an increase in intracellular sodium and a decrease in intracellular potassium and magnesium
• Protein synthesis is reduced
SKIN, MUSCLES AND GLANDS

- THE skin and subcutaneous fat are and glands atrophied, which leads to loose folds
- Many signs of dehydration are unreliable; eyes may be sunken because of loss of subcutaneous fat in the orbit
- Many glands, including the sweat, tear and salivary glands, are atrophied; the child has dryness of the mouth and eyes and sweat production is reduced
- Respiratory muscles are easily fatigued; the child is lacking in energy
Categories of Under nutrition

• Acute and Chronic under nutrition.
• Children can have a combination of both acute and chronic under nutrition.
• Acute under nutrition is categorized into Moderate and Severe acute under nutrition, determined by the client's degree of wasting (*is an indicator of acute undernutrition, the result of more recent food deprivation or illness*).
• All cases of bi-lateral oedema are categorized as severe acute under nutrition.
Categories of under nutrition continued...

- Chronic under nutrition is determined by a patient’s degree of stunting (the result of prolonged food deprivation and/or disease or illness), i.e. when a child has not reached his or her expected height for a given age.

- To treat a patient with chronic under nutrition requires a long-term focus that considers household food insecurity in the long run; home care practices (feeding and hygiene practices); and issues related to public health.
Assessment

- Anthropometry
- Biochemical
- Clinical
- Dietary
- Economic (social-economic status)
<table>
<thead>
<tr>
<th>Indicator</th>
<th>Severe acute under nutrition</th>
<th>Moderate acute under nutrition</th>
<th>Mild acute under nutrition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Children 6 months to 59 months</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight for height / Length Z scores</td>
<td>&lt; -3 Z score</td>
<td>Between –3 to &lt; -2 Z score</td>
<td>Between -2 to &lt; -1 Z score</td>
</tr>
<tr>
<td>Weight for height / Length % of median</td>
<td>&lt; 70% W/H</td>
<td>Between 70 – 80 % W/H</td>
<td>Between 80 – 90%</td>
</tr>
<tr>
<td>MUAC</td>
<td>&lt; 11 cm (under 5s)</td>
<td>11 – 13 cm (under 5s)</td>
<td></td>
</tr>
<tr>
<td>Bilateral pitting Oedema</td>
<td>Oedema (+) present</td>
<td>Oedema absent</td>
<td>Oedema absent</td>
</tr>
<tr>
<td><strong>Children 5 – 9 years</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMI for age Z scores</td>
<td>&lt; -3 Z score</td>
<td>Between –3 and -2 Z score</td>
<td>Between -2 to &lt; -1 Z score</td>
</tr>
<tr>
<td>MUAC</td>
<td>&lt; 13.5 cm</td>
<td>Between 13.5 – 14.5 cm</td>
<td></td>
</tr>
<tr>
<td>Bilateral pitting Oedema</td>
<td>Oedema (+) present</td>
<td>Oedema absent</td>
<td>Oedema absent</td>
</tr>
<tr>
<td><strong>Adolescents 10 – 17 years</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMI for Age Z score</td>
<td>&lt; -3 Z score</td>
<td>Between -3 and -2 Z score</td>
<td>Between -2 to &lt; -1 Z score</td>
</tr>
<tr>
<td>MUAC</td>
<td>&lt; 16 cm</td>
<td>Between 16 – 18.5cm</td>
<td></td>
</tr>
<tr>
<td>Bilateral pitting Oedema</td>
<td>Oedema (+) present</td>
<td>Oedema absent</td>
<td>Oedema absent</td>
</tr>
<tr>
<td><strong>Adults 18 years and above</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMI</td>
<td>&lt; 16 cm</td>
<td>Between 16 – 17 kg/m²</td>
<td>Between 17 – 18.5 kg/m²</td>
</tr>
<tr>
<td>MUAC</td>
<td>- &lt;16 cm</td>
<td>16 - 18.5cm with no relevant clinical signs. Few relevant social criteria</td>
<td></td>
</tr>
<tr>
<td>Oedema</td>
<td>Oedema (+) present</td>
<td>Oedema absent</td>
<td></td>
</tr>
<tr>
<td><strong>Pregnant or postpartum women</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MUAC</td>
<td>&lt; 22 cm</td>
<td>Between 22 - 23 cm</td>
<td>Between 23 – 24 cm</td>
</tr>
<tr>
<td>Oedema</td>
<td>Oedema (+) present</td>
<td>Oedema absent</td>
<td></td>
</tr>
</tbody>
</table>
Course 3b: Severe malnutrition 1–

recognition and early treatment
Objectives

• Learn to recognise severe malnutrition
• Learn to manage **ALL** the problems present in these children
• Understand new approaches to feeding and recognise it as the **primary** treatment.
Definitions of Severe PEM (1)

WHO Classification:

<table>
<thead>
<tr>
<th></th>
<th>+ Oedema</th>
<th>No oedema</th>
</tr>
</thead>
<tbody>
<tr>
<td>(WHZ &lt;-3)</td>
<td>Severe wasting + oedema*</td>
<td>Severe wasting</td>
</tr>
</tbody>
</table>

* If there is severe oedema the weight may appear reasonable initially.
**Definitions of Severe PEM (2)**

**WHO Classification:**

<table>
<thead>
<tr>
<th>WHZ &lt;-3</th>
<th>+ Oedema</th>
<th>No oedema</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe wasting + oedema*</td>
<td>Severe wasting</td>
<td></td>
</tr>
</tbody>
</table>

Two simple signs are useful for classification
Clinical Diagnosis / Definition

• Presence of visible severe wasting
  – Buttocks, thighs, shoulders

• Presence of symmetrical oedema with supporting evidence for kwashiorkor:
  – Skin changes
  – Hair changes

• Weight for age (Road to Health Card Chart)

• Should be the minimum form of assessment
Clinical Diagnosis

But you have to look.....it is often missed

Source: KEMRI /Wellcome Trust
Why is detecting malnutrition important?

• In many hospitals the commonest reason for death of a child in hospital is PEM

• Case fatality of severe malnutrition in hospital in Africa is 30-40% (3 or 4 out of 10 die in hospital)

• If it is not recognised it is not treated properly and deaths are not prevented.
Kwashiorkor – where logic fails

Source: KEMRI /Wellcome Trust
Kwashiorkor – where logic fails

Source: KEMRI /Wellcome Trust
Severe malnutrition

Protein - Energy Malnutrition
Severe malnutrition

- Protein - Energy Malnutrition
- Electrolyte and mineral deficiencies
- Micronutrient and Vitamin deficiencies
Electrolyte / Mineral Deficiencies

• Potassium:
  – Potassium supplements help reduce oedema
  – Muscle weakness / apathy
  – Reduced cardiac output.

• Magnesium (convulsions / arrhythmias)

• Zinc (diarrhoea / skin disease)

• Copper (anaemia)

• Selenium (heart failure)

Source: KEMRI /Wellcome Trust
Electrolytes / Minerals – What about Sodium?

• Total body sodium is often increased
  – Expansion of extracellular fluid volume
  – Leakage of sodium into cells – sick cell syndrome

• Giving sodium (iv fluids / salty foods) can be dangerous
What other problems do these children commonly have?
10 Step Approach

- Hypoglycaemia
- Hypothermia
- Dehydration
- Electrolytes
- Infection
- Micronutrients
- Initiate feeding
- Catch-up growth
- Sensory stimulation
- Discharge preparation

Monitoring
Hypoglycaemia and Hypothermia

• All new admissions with malnutrition should be kept warm until there are signs of recovery.

• iv or ngt glucose for those who are unconscious or very severely ill with no glucose measurement.

• Immediate ngt feeding for conscious children with blood glucose < 3mmol/l
Dehydration

• Shock is treated with special fluid plans and Half-Strength Darrow’s with 5% dextrose.
• Oral rehydration is with ReSoMal.
• Feeding must be started by 12 hours.
Oral re-hydration in Severe Malnutrition.

<table>
<thead>
<tr>
<th>All concentrations are in mmol/l</th>
<th>Na⁺</th>
<th>K⁺</th>
<th>Osmolarity Glucose</th>
<th>Osmolarity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>New WHO / UNICEF ORS</strong></td>
<td>75</td>
<td>20</td>
<td>111</td>
<td></td>
</tr>
<tr>
<td><strong>Rehydration Solution for Malnutrition – ReSoMal</strong></td>
<td>45</td>
<td>40</td>
<td>~ 200 Glucose &amp; saccharose</td>
<td></td>
</tr>
</tbody>
</table>

*Add 2 WHO ORS ‘500ml’ sachets to 2 litres water rather than 1 litre, then add 50g (5 teaspoons) sugar and 60 mmols Potassium Chloride (3 10ml iv vials of strong potassium, 20mmols/10mls)*
Composition of RESOMAL

Concentration/litre:
- Glucose 55 mmol
- Saccharose 73 mmol
- Potassium 40 mmol
- Sodium 45 mmol
- Chloride 70 mmol
- Citrate 7 mmol
- Magnesium 3 mmol
- Zinc 300 μmol
- Copper 45 μmol

Osmolarity of the solution: 294 mEq/litre

A Conserver à l’abri de la chaleur et de l’humidité. Keep dry and cool.
• Note use of 2 liters of water
Oral re-hydration in Severe Malnutrition

- Resomal 5ml/kg every 30 mins for 2 hours.
- Use an ngt early.
- Then 5 – 10 mls/kg each hour for a maximum of 10 hours
  - Give 10 if the child thirsty / severe dehydration, 5 if not.
- Introduce starter milk (F-75) at 4 hours and slowly replace Resomal with starter milk over 12 hours.
- Continue breast feeding throughout.
Electrolytes & Minerals

• All severely malnourished children have potassium deficiency.
• All should receive an extra 4mmol/kg/day of oral potassium (after stopping ReSoMal).
• Ideally should receive Mg, Zn, Cu and Se as part of mineral mix – added to milk feed.
Infection

• Up to 1/3\textsuperscript{rd} children with malnutrition who die have septicaemia / bacteraemia

• Fever and other signs of infection are not helpful in identifying these children when there is severe malnutrition.

• ALL children with severe malnutrition sick enough to be in hospital should be started on Penicillin (or Ampicillin) and Gentamicin for at least 5 days.

• In addition they receive oral metronidazole and treatment for thrush if present.
Vitamin A deficiency
Vitamins

• Vitamin A:
  – With Eye signs: 200,000 iu on admission, on Day 2 and on Day 14 (100,000 iu if aged < 12 months).
  – Without Eye signs: stat dose appropriate for age

• Multivitamins – 1 tablet twice daily for 14 days.
First feeding.

• Feeds need to be prescribed – they are treatment!
Questions?
Course 3c: Severe malnutrition 2-
nutritional treatment
Objectives

• Understand the link between observed pathophysiological abnormalities and treatment.

• Consider the priorities and aims of immediate nutritional management.

• Non-nutritional management is considered elsewhere.
What are the problems faced in providing acute nutritional therapy?

- Reduced appetite and willingness to feed
- Fatty liver with reduced synthetic functions
- Absorption of nutrients is probably adequate but may be reduced by diarrhoea and small bowel bacterial overgrowth
- Reduced renal ability to excrete sodium
- Impaired cardiac contractility

A state of physiological ‘standby’ - awaiting gentle re-awakening
Gentle nutritional rescue – the process of feeding

- Immediate feeding
- Small volume / frequent feeding because of small stomach capacity and precarious physiology
- Vomiting is NOT a contraindication to feeding
- Routine insertion of a naso-gastric tube should be considered
- Feeds are the ‘drug’ to cure malnutrition, they are a priority (after correction of dehydration if required).
designed for the phase 1 of the treatment of severe malnutrition

F-75 is to be used during the initial stage of treatment. It is not designed to promote weight gain. It is not suitable for feeding well-nourished children.
Un sachet représente la quantité de produit à ajouter et à mélanger à 2 litres d'eau bouillie pour obtenir 2,4 litres d'un lait dont la valeur nutritionnelle moyenne est :

Each sachet contains the quantity of product to be added and mixed with 2 litres of boiled water to obtain 2.4 litres of milk for which the average nutritional value is:

<table>
<thead>
<tr>
<th>Éléments</th>
<th>/100 g de produit sec</th>
<th>/litre de lait F-75</th>
<th>Éléments</th>
<th>/100 g de produit sec</th>
<th>/litre de lait F-75</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energie</td>
<td>446 kcal</td>
<td>750 kcal</td>
<td>Biotine</td>
<td>60 µg</td>
<td>100 µg</td>
</tr>
<tr>
<td>Protéines</td>
<td>5 % de l'énergie</td>
<td></td>
<td>Ac. pantothenique</td>
<td>3 µg</td>
<td>5,1 µg</td>
</tr>
<tr>
<td>Lipides</td>
<td>31 % de l'énergie</td>
<td></td>
<td>Vitamine K</td>
<td>24 µg</td>
<td>40 µg</td>
</tr>
<tr>
<td>Vitamine A</td>
<td>0,9 mg</td>
<td>1500 µg</td>
<td>Sodium</td>
<td>&lt; 87 mg</td>
<td>&lt; 150 mg</td>
</tr>
<tr>
<td>Vitamine D</td>
<td>18 µg</td>
<td>30 µg</td>
<td>Calcium</td>
<td>560 mg</td>
<td>950 mg</td>
</tr>
<tr>
<td>Vitamine E</td>
<td>20 mg</td>
<td>34 µg</td>
<td>Phosphore</td>
<td>330 mg</td>
<td>560 mg</td>
</tr>
<tr>
<td>Vitamine C</td>
<td>59 mg</td>
<td>100 mg</td>
<td>Magnésium</td>
<td>50 mg</td>
<td>85 mg</td>
</tr>
<tr>
<td>Vitamine B1</td>
<td>0,5 mg</td>
<td>0,8 mg</td>
<td>Zinc</td>
<td>12,2 mg</td>
<td>20,5 mg</td>
</tr>
<tr>
<td>Vitamine B2</td>
<td>1,2 mg</td>
<td>2,7 mg</td>
<td>Iode</td>
<td>100 µg</td>
<td>170 µg</td>
</tr>
<tr>
<td>Niacine</td>
<td>5 mg</td>
<td>8,5 mg</td>
<td>Potassium</td>
<td>775 mg</td>
<td>1320 µg</td>
</tr>
<tr>
<td>Vitamine B6</td>
<td>0,6 mg</td>
<td>1 mg</td>
<td>Cuivre</td>
<td>1,7 mg</td>
<td>2,8 mg</td>
</tr>
<tr>
<td>Ac. folique</td>
<td>200 µg</td>
<td>340 µg</td>
<td>Sélénium</td>
<td>30 µg</td>
<td>47 µg</td>
</tr>
<tr>
<td>Vitamine B12</td>
<td>1,6 µg</td>
<td>2,7 µg</td>
<td>Fer</td>
<td>&lt; 0,3 µg</td>
<td>&lt; 0,5 µg</td>
</tr>
</tbody>
</table>

**The feed content – 1 litre of F75**

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dried skimmed milk</td>
<td>25g</td>
</tr>
<tr>
<td>Sugar</td>
<td>100g</td>
</tr>
<tr>
<td>Vegetable Oil</td>
<td>27mls</td>
</tr>
<tr>
<td>Mineral solution</td>
<td>20mls</td>
</tr>
<tr>
<td>Water</td>
<td>make up to 1000mls</td>
</tr>
</tbody>
</table>

Mineral solution ideally contains minerals and trace elements - if not available at least add 40mmols potassium (2x 10mls iv KCl vials) to each 1000mls of feed.
The feeding plan – a prescription

• What is the weight?
• Marasmus
  – 130 ml/kg/day start-up feed
• Kwashiorkor / marasmic kwashiorkor:
  – 100 mls/kg/day start-up feed
• Ideally given in 12 two hourly feeds, or, if not possible, 8 three hourly feeds
• .....this means at night too!
What would this provide?

<table>
<thead>
<tr>
<th></th>
<th>Marasmus 130 mls/kg/day</th>
<th>Kwashiorkor 100 mls/kg/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calories</td>
<td>100 kcal/kg/day</td>
<td>75 kcal/kg/day</td>
</tr>
<tr>
<td>Protein</td>
<td>1 – 1.5 g/kg/day</td>
<td>0.75 – 1.3 g/kg/day</td>
</tr>
</tbody>
</table>
Why do we not give more?

• The body really cannot tolerate more
• Too vigorous re-feeding has been associated with increased mortality.
• Too much sugar can cause an osmotic diarrhoea
• Higher protein contents are usually associated with higher sodium contents that can make oedema worse and precipitate heart failure.
Feeding this child? – 10kg

- Total 24 hour feeds?
- 3 hourly feed volume?
Feeding this child? – 10kg

• Total 24 hour feeds?
  – 1300 mls

• 3 hourly feed volume?
  – 165 mls
Standard initial nutritional prescription...age 3 yrs, 10 kg

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>F-75</td>
<td>165 mls 3 hourly</td>
</tr>
<tr>
<td>Potassium chloride 5mmol tabs (crushed in feed)</td>
<td>2 tabs qds</td>
</tr>
<tr>
<td>Vitamin A (has eye signs)</td>
<td>200,000 iu stat, on day 2 and day 14</td>
</tr>
<tr>
<td>Multivitamin</td>
<td>1 tab twice daily</td>
</tr>
</tbody>
</table>
When to change from rescue feeding?

• **Return of appetite:**
  – 2 to 3 days after admission in those with no oedema and modest levels of activity
  – 5 to 7 days after admission in those with severe lethargy / severely ill at admission

• **Oedema:**
  – You **do not** have to wait for resolution of oedema before changing to recovery feeding if the child has a good appetite.

• **Feed with cup / cup and spoon**
Weight gain in the first week

• Rescue feeding is usually NOT associated with weight gain
• Weight loss may even occur in children whose oedema is improving
• Do not panic!
  – Ensure at least 100 mls/kg/day of starter feed has been given.
  – Early recovery involves loss of body water (reducing weight) and increases in cellular mass (increasing weight)
• Appetite and activity level denote recovery in the first week, **not** weight change.
the treatment of severe malnutrition

F-100 is not suitable for long term feeding of well-nourished children

nutriset

destiné au traitement de la malnutrition sévère

designed for the treatment of severe malnutrition

F-100 is not suitable for long term feeding of well-nourished children
F100: to be mixed with 2 litres of water. Note it has vitamins.
Contains peanut paste, vegetable fat, dry skimmed milk, dry whey, sugar, minerals & vitamin complex
Plumpy'nut® is suitable for all people (children from 6 months upwards or adults) suffering from severe or moderate malnutrition (follow the WHO* protocol)

Plumpy'nut® does not need any prior cooking or dilution. Just open the sachet and eat the contents.

- Plumpy'nut® can be kept for up to 24 months.
- It is recommended that plumpy'nut® be stored in a cool, dry place, at a temperature below 30°C.
- Plumpy'nut® packaging can be disposed of by burning.

Content: Vegetable fat, peanut paste, dry skimmed milk, whey powder, malto-dextrin, sugars, minerals and vitamins.

Average nutritional value per sachet of 500 kcal (92 g):
Proteins: 12.5 g. Lipids: 32.6 g.
Vitamins: A (840 µg), D (15 µg), E (18.4 mg), C (49 mg), B1 (0.55 mg), B2 (1.66 mg), B6 (0.55 mg), B12 (1.66 µg), K (19.3 µg), biotin (60 µg), folic acid (193 µg), pantothenic acid (2.85 mg), niacin (4.88 mg).
Minerals: calcium (276 mg), phosphorus (276 mg), potassium (1022 mg), magnesium (84.6 mg), zinc (12.9 mg), copper (1.6 mg), iron (10.6 mg), iodine (100 µg), sodium (<266 mg), selenium (27.60 µg).

RUTF: plumpy'nut® complies with the definition of RUTF: Ready to Use Therapeutic Food that requires no prior preparation, dilution or reconstitution.


plumpy'nut® is a Nutriset product
# The feed content – 1 litre of F100

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dried skimmed milk</td>
<td>80g</td>
</tr>
<tr>
<td>Sugar</td>
<td>50g</td>
</tr>
<tr>
<td>Vegetable Oil</td>
<td>60mls</td>
</tr>
<tr>
<td>Mineral solution</td>
<td>20mls</td>
</tr>
<tr>
<td>Water</td>
<td>make up to 1000mls</td>
</tr>
</tbody>
</table>

Mineral solution ideally contains minerals and trace elements - if not available at least add 40mmols potassium (2x 10mls iv KCl vials) to each 1000mls of feed.
What would this provide?

<table>
<thead>
<tr>
<th></th>
<th>F75 – Starter 100mls</th>
<th>F100 – Catch-up 100mls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calories</td>
<td>75 kcal</td>
<td>100 kcal</td>
</tr>
<tr>
<td>Protein</td>
<td>0.9 g</td>
<td>3g</td>
</tr>
</tbody>
</table>
A feeding plan

Admission

130 or 100 ml/kg/day as 3 hourly feeds, for 2-7 days
A feeding plan

- Admission
- Appetite recovers

F100, same volume as F75

130 ml/kg/day as 3 hourly feeds for 2 – 3 days
A feeding plan

Admission

Appetite recovers

F75, same volume as F75

Good appetite, clinically stable

F100, volume increasing until appetite satisfied
A feeding plan

Increase each feed by 10mls until some is not eaten – usually achieve 180 – 200 ml/kg/day

F100, volume increasing until appetite satisfied

Good appetite, clinically stable
Preparation of small quantities of resomal,F75 AND F100 therapeutic milk
OBJECTIVES

Be able to:

- Adequately reconstitute small quantities of ReSoMal, F75 and F100 therapeutic milk
- Use appropriate household measures while measuring volumes of ReSoMal, F75 and F100
You can use the NUTRISET measuring scoop to measure the right quantity of powder to prepare small quantities of ReSoMal, F75 and F100
WARNING

The following data is ONLY valid with the NUTRISET measuring scoop.
Nutriset measuring scoops are easily recognisable. They are RED with the NUTRISET logo embossed on the handle.
PREPARATION OF RESOMAL

• Mix 1 level scoopful of ReSoMal into 140ml of water

PREPARATION OF F-75 THERAPEUTIC MILK
Mix 1 level scoopful of F-75 therapeutic milk powder into 20ml of water
PREPARATION OF F-100

• Mix 1 level scoopful of F100 therapeutic milk powder into 18 ml of water
Prescribing RUFT

• How many packets would you give a two years old who weighs 10kg and has kwashiorkor and is in the translation period?
Then what?
Rehabilitation

- Introduce solid foods and increase to 5 appropriate meals a day.
- Continue snacks in between
- Continue breast feeding
- Continue mineral supplements for 2 weeks
- Start oral iron and mebendazole therapy after 1 week
- Monitor progress
- Provide stimulation / play
- Educate the family and prepare for discharge
Monitoring 2

- Intake of feed should be monitored throughout.
- If there is concern for heart failure (↑HR, ↑RR) in the rescue phase reduce feed volumes for 24 hours.
- Weight gain in recovery / rehabilitation phases:
  - Poor, <5g/kg/day, full re-assessment
  - Moderate, 5 – 10g/kg/day, check intake adequate, is there untreated infection
  - Good, >10g/kg/day
When to discharge?

• Completed antibiotics
• Good appetite and gaining weight
• Lost any oedema
• Appropriate support in the community or home
• Mother / carer:
  – Available
  – Understands child’s needs
  – Able to supply needs
10 Step Approach

- Hypoglycaemia
- Hypothermia
- Dehydration
- Electrolytes
- Infection
- Micronutrients
- Initiate feeding
- Catch-up growth
- Sensory stimulation
- Discharge preparation

Monitoring
Questions?
Summary

• The rescue phase of nutritional support requires gentle introduction of calories and small amounts of protein.
• Potassium, vitamins and ideally other minerals should routinely be given
• Recovery feeding starts as the appetite returns and is gradually scaled up.
• You are asked to see a 2 year old boy in OPD who is said to have severe wasting and look very unwell.

What do you do?
1. Oxygen 1-2 l/min via nasal prongs.
2. IV HSD in 5% Dextrose 120mls in 1 hr- 70 drops per min.
3. IV 10% dextrose 35 mls over 5min
4. Keep warm.
5. KCl 10mmol added in tds feed
6. IV X-pen 700,000 IU 6 hrly.
7. IV Chloramphenicol 175 mg 6 hrly.
8. IM Quinine 105mg stat then 70 mg 12hrly.
Rx- 2

8. Vit A 200,000IU stat. Eye changes ???
9. Multivit 1 tab BD for 2 weeks.
10. Folic acid 2.5 mg on alt days.
11. Zinc 20 mg OD for 2 weeks.
12. F75; 910 mls in 24 hrs – 115 mls 3hrly
Fluid plan - Resomal 70mls hourly

Resomal 0800hrs – 70mls
Resomal 0900hrs - 70 mls
Resomal 1000hrs-70 mls

F75 1100hrs – 70 mls

Resomal MD – 70mls
Resomal 1300hrs- 70 mls
Resomal 1400hrs-70 mls

F75 1500hrs – 70 mls

Resomal 1600hrs- 70mls

Then F75; 115mls every 3 hrs
Resomal 70mls after every loose stool
Summary.

- The risk of death in children with severe malnutrition is very high.
- The children have many problems and each needs treating.
- The 10 steps approach allows each problem to be treated.
- Feeding should not be a high protein diet.
OUT PATIENT CARE....

[Image of a child opening a package]
OBJECTIVES

• Increase coverage and access to treatment

• Timeliness: Case finding and treatment before malnutrition escalate

• Appropriate care: effective treatment for those who can be treated at home
WHO IS ELIGIBLE?

• Those with severe acute malnutrition (SAM) with no medical complications are treated at OTP and are given RUTF and routine medicines to take home.

• Only applicable in a setting where OTP has been established and RUTF available
TRIAGE...ADMISSION CRITERIA

MEDICAL EXAMINATION AND APPETITE TEST

SAM with complications
- Nutritional oedema ++, +++
  OR
- Marasmic Kwashiorkor (WHZ<-3 OR/MUAC<115mm with any grade of oedema)
  OR
- WHZ<-3 (OR WHM<70%)
  • MUAC<115mm
  • Nutritional oedema +
  AND
  No appetite and/or complications (IMCI danger signs)
  Infants
  6 months unable to suckle or visibly wasted

In Patient Care

SAM without complications
- WHZ<-3
  OR
- MUAC<115mm
  OR
- Nutritional oedema +
  AND
- Appetite
- Clinically well
- Alert

Moderate Acute malnutrition without complications
- WHZ>-3 and <-2
  OR
- MUAC >115mm and <125mm

Out Patient Care

Supplementary Feeding
APPETITE TEST (1)

Why to conduct one?

• Major medical complications lead to loss of appetite

• It is mainly metabolic malnutrition that causes death. Often the only sign of severe metabolic malnutrition is a reduction in appetite

→ A poor appetite means that the child has a significant infection or a major metabolic abnormality such as liver dysfunction, cell membrane damage, electrolyte imbalance. These children are at immediate risk of death and need inpatient care.
APPETITE TEST (2)

How to conduct one?

• In a separate area
• Explain to care giver how
• Care giver washes hands
• Care giver offers RUTF
• Child need to be offered plenty of water
APPETITE TEST (3)

Result of the appetite test

A child who takes the minimum amount for their weight as indicated in the table has passed.

A child that does not take at least the amount of RUTF indicated in the table has failed.

<table>
<thead>
<tr>
<th>Kg</th>
<th>Sachets</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;4</td>
<td>1/8 to ¼</td>
</tr>
<tr>
<td>4-6.9</td>
<td>¼ to 1/3</td>
</tr>
<tr>
<td>7-9.9</td>
<td>1/3 to ½</td>
</tr>
<tr>
<td>10-14.9</td>
<td>½ to ¾</td>
</tr>
<tr>
<td>15-29</td>
<td>¾ to 1</td>
</tr>
<tr>
<td>&gt;30</td>
<td>&gt;1</td>
</tr>
</tbody>
</table>
Ready-to-Use Therapeutic Food (RUTF)

• This is a specialized food that is:
• developed specifically for the recovery of severe malnutrition at home.
• energy-dense, mineral/vitamin-enriched product equivalent to F100 with added iron.
• It contains the required energy and micronutrients to meet the nutritional needs of the severely malnourished child.
• oil-based, ready-to-use product that has a low risk of contamination. It provides approximately 530Kcal per 100g.
• Used for nutrition rehabilitation in the community and is effective when the patient receives a weekly supply of take home RUTF. Why?
FOOD RATIONS (2)

Ration

• The ration given to a severely malnourished child is based on the intake requirement of between 150-200 kcal/kg/day.

• The amount of RUTF to be consumed per day is based on the weight of the child
# FOOD RATIONS (3)

<table>
<thead>
<tr>
<th>Class of weight (kg)</th>
<th>RUTF</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>sachet per day</td>
</tr>
<tr>
<td>3.5 - 3.9</td>
<td>1.5</td>
</tr>
<tr>
<td>4.0 - 5.4</td>
<td>2</td>
</tr>
<tr>
<td>5.5 - 6.9</td>
<td>2.5</td>
</tr>
<tr>
<td>7.0 - 8.4</td>
<td>3</td>
</tr>
<tr>
<td>8.5 - 9.4</td>
<td>3.5</td>
</tr>
<tr>
<td>9.5 - 10.4</td>
<td>4</td>
</tr>
<tr>
<td>10.5 - 11.9</td>
<td>4.5</td>
</tr>
<tr>
<td>≥ 12</td>
<td>5</td>
</tr>
</tbody>
</table>
# ROUTINE MEDICATION

<table>
<thead>
<tr>
<th>Medication</th>
<th>Direct admission to out-patient community nutrition care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitamin A</td>
<td>One (1) dose on the fourth week (fourth visit)</td>
</tr>
<tr>
<td>Folic Acid</td>
<td>One (1) dose at health facility on admission, if signs of anaemia</td>
</tr>
<tr>
<td>Amoxicillin</td>
<td>Give first dose at the health facility <strong>and</strong> give remainder of treatment to the parent/caregiver with instructions to give twice daily for seven days at home</td>
</tr>
<tr>
<td>Malaria</td>
<td>According to national protocol</td>
</tr>
<tr>
<td>Measles (children 6 months and older)</td>
<td>1 vaccine on the fourth week (fourth visit)</td>
</tr>
<tr>
<td>Iron</td>
<td>None: sufficient iron is in RUTF</td>
</tr>
<tr>
<td>De-worming (children &gt;1 year old)</td>
<td>1 dose on the second week (second visit)</td>
</tr>
</tbody>
</table>
## MONITORING

<table>
<thead>
<tr>
<th>Task</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient attends health facility</td>
<td>weekly</td>
</tr>
<tr>
<td>Patient receives replacement RUTF</td>
<td>weekly</td>
</tr>
<tr>
<td>Health worker checks weight</td>
<td>weekly</td>
</tr>
<tr>
<td>Health worker checks MUAC</td>
<td>weekly</td>
</tr>
<tr>
<td>Health worker checks height</td>
<td>monthly</td>
</tr>
<tr>
<td>Health worker checks vital signs: temperature, pulse &amp; respiration rate</td>
<td>weekly</td>
</tr>
<tr>
<td>Health worker conducts Appetite Test</td>
<td>weekly</td>
</tr>
<tr>
<td>Health worker does medical check</td>
<td>weekly</td>
</tr>
<tr>
<td>Health worker fills in patient card and ration card</td>
<td>weekly</td>
</tr>
</tbody>
</table>
HOME CARE

Community health workers and Care givers are playing a key role in the recovery of the child (!!!)

• Ensure food eaten (only RUTF)
• Give safe water to drink
• Wash hands
• Do not share RUTF with other members
• Seek CHW if concerned with patient’s condition
• Give routine medicine
• Attend health facilities for weekly visits
• Keep child warm
TRANSFER TO INPATIENT CARE

If the outpatients develops any of the following, the patient is transferred to the in-patient facility:

- Failure of appetite test
- Increase or develop oedema
- Re-feeding diarrhea that leads to weight loss
- Weight loss for 3 consecutive weighing, or 2 weeks
- Weight loss of more than 5% of body weight at any visit
- Static weight for 3 consecutive weighing
- Fulfilling any criteria of ‘failure to respond’ (next slide)
### Out Patient Community Nutrition Care

#### Criteria for failure to respond

<table>
<thead>
<tr>
<th>Condition</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary failure to respond</strong></td>
<td></td>
</tr>
<tr>
<td>Failure to gain any weight (non-oedematous children)</td>
<td>21 days</td>
</tr>
<tr>
<td>Failure to start to lose oedema</td>
<td>14 days</td>
</tr>
<tr>
<td>Oedema still present</td>
<td>21 days</td>
</tr>
<tr>
<td>Weight loss since admission to program (non-oedematous children)</td>
<td>14 days</td>
</tr>
<tr>
<td><strong>Secondary failure to respond</strong></td>
<td></td>
</tr>
<tr>
<td>Failure of Appetite test</td>
<td>At any visit</td>
</tr>
<tr>
<td>Weight loss of 5% of body weight</td>
<td>At any visit</td>
</tr>
<tr>
<td>Weight loss for two successive visits</td>
<td>14 days</td>
</tr>
</tbody>
</table>
POSSIBLE CAUSE OF FAILURE

- Community care is inappropriate for patients to go directly to out-patient care
- Poorly conducted appetite test
- Inadequate instructions given to mothers
- Inaccurate quantity of RUTF dispensed to child
- Health facility long distance
- Share of food with siblings...or caregivers
- Micronutrients deficiency
- Mal-absorption
- Unwilling or too busy care giver
## DISCHARGE CRITERIA FROM OTP TO SFP

| Cured |  □ W/H >80% (where there is SFP) or W/H >85% (in the absence of SFP) for two consecutive measurements and  
|       |  □ MUAC >11.0cm and  
|       |  □ No oedema for two consecutive visits.  
|       |  □ W/H -2 Z-score (where there is SFP)  
|       |  □ W/H -1 Z-score where there is no SFP  
|       |  □ Children admitted on MUAC, or stabilised from an in-patient facility, are discharged from the outpatient community nutrition care after a minimum of two months. |

| Defaulted | Absent for two consecutive visits |
| Died | Died while registered in the out-patient community nutrition care |

| Non-recovered | Has not achieved discharge criteria within four months. Link the child to other programmes e.g. IMCI, OVC, HBC, ART Clinics, or targeted food distributions. |