Inpatient Management of Severe Malnutrition
Based on the WHO ten steps

Admit all children with SEVERE MALNUTRITION (kwashiorkor, marasmus & marasmic-kwashiorkor). In some South African Hospitals, inpatient mortality for kwashiorkor and marasmus is over 50%. Don’t let your hospital be one of these.

Categorise
“Sitting Kwashy”
A sitting kwashy is a child with signs of kwashiorkor but who has no obvious infection (gastro, ARI etc) and no weeping skin lesions. This child can sit up and is not acutely sick.

“Lying Kwashy”
A lying kwashy is any child with signs of malnutrition and any infection (gastro, ARI etc) and who may or may not have weeping skin lesions. These children are usually apathetic and unable to sit.

Investigations on Admission
All children with severe malnutrition
1) Urgent blood sugar
2) Chest x-ray (ARI/TB)
3) Urine Dipstix
4) Ward haemoglobin
5) HIV ELISA
6) Tine (remember false +ve’s)

All Children who fall into the category of a lying kwashy should have the above PLUS
1) Full blood count
2) Urea, creatinine, Na⁺, K⁺, total protein and albumin
3) Blood culture
4) Urine and cerebrospinal fluid cultures where indicated
5) Pus swabs if skin sepsis or weeping skin lesions present

Routine ward Management
1. Hypoglycaemia
Hypoglycaemia occurs commonly and is an important cause of death, especially in the early hours of the morning.
Treat hypoglycaemia
Do blood glucose on admission and then 3 hourly before feeds. If blood glucose is less than 2.6 mmol, give a feed immediately. Recheck blood glucose in 1/2 hour. If the child is unable to take feeds orally or via nasogastric tube (because of vomiting or abdominal distension) or the feed has not corrected the hypoglycaemia then correct hypoglycaemia intravenously. Correct by diluting 50% glucose with sterile water 1:4 to make a 10% solution and give the child 5ml/kg slowly IV. Recheck blood glucose after half an hour to be sure the hypoglycaemia has resolved.
Prevent hypoglycaemia
Give 3 hourly feeds. Never miss a feed. If a child refuses a feed, insert a nasogastric tube and give the feed. If the child is unable to take feeds enterally then ensure that the child is getting the correct volume of the appropriate IV fluid. If a child becomes hypoglycaemic before the 3 hourly feed then increase the frequency of the feeds to 2 hourly. Routine blood sugar monitoring can usually be discontinued after 24 - 48 hours providing that the child is improving and that the blood sugar has been normal for 24 hours.

2. Hypothermia
Hypothermia occurs commonly and can kill. It is often associated with hypoglycaemia.
Treat and prevent hypothermia
Whenever possible admit the mother or caregiver with the child. Plan to provide the mother with a bed so that the child can sleep with her and so be warmed by her body heat. When this is not feasible ensure that the child is always well covered and not lying wet or exposed. If the child’s temperature is below 36°C, warm the child with warmed blankets and place the child near a heater. Measure the temperature 4 hourly.
3. Fluids

**Oral**
Whenever possible give maintenance fluids as milk/artificial feed orally or via NGT and in the usual volumes for age
- < 1 year: 120 ml/kg/day
- 1 - 2 years: 100 ml/kg/day
- 2 - 4 years: 85 ml/kg/day
- 4 - 10 years: 70 ml/kg/day

**Intravenous**
If a child is unable to take maintenance fluids enterally then restrict intravenous maintenance to ⅔ of oral maintenance volume. The usual fluid used is Paediatric Maintenance Solution (PMS), or ½ DD in gastroenteritis. Start enteral feeds and cut back on intravenous fluid as soon as possible.

**Type of Maintenance**
- Continue breastfeeding if the child is breastfeeding
- If a child is unable to tolerate enteric feeding then start with IV fluids at a maximum of ⅔ oral maintenance volume and start small volumes full strength milk as soon as possible
- If gastroenteritis is a problem use a soya free milk (eg Pelargon)
- If oedema is still present after one week consider ongoing infection, diarrhoea, or poor intake

4. Supplements

**Potassium**
**Oral:** Most children with severe malnutrition are potassium depleted. Give KCl 0.5ml/kg 8H PO until the oedema has resolved. Use with caution when renal failure is present (1 ml Mist Pot Chlor = 1 mmol K⁺ = 75g KCl).
**Intravenous:** If the child cannot tolerate oral feeds add 15% KCl to the IV fluid. Maximum safe concentration of IV KCl is 40mmol/litre (this can be achieved by adding 2ml of KCl 15% to 200ml ½ DD or PMS). Monitor K⁺ daily.

**Trace Elements**
Children with severe malnutrition have micronutrient deficiencies. Give a ‘Trace Element Mix’ (see page 4: “Trace Element Mix”) < 10 kg: 2.5ml 24H PO; 10 - 20 kg: 5ml 24H PO

At most hospitals only zinc-copper or zinc sulphate solutions are available – this is an advocacy issue

**Vitamin A**
Give VITAMIN A to all children on admission:
- < 1 Year  100 000iu stat PO
- > 1 Year  200 000iu stat PO

**Multivitamins**
Give 2.5 - 5ml of MULTIVITAMIN syrup 24H PO to all children with malnutrition, for the duration of their stay.

**Haematinsics**
FOLATE 5mg 24H PO for I month, from admission
ELEMENTAL IRON 3 mg/kg 24H PO once the child has lost the oedema, and continue for 3 months. (Don’t give iron in the acute phase because free radicals encourage bacterial proliferation)

5. Infection

**Lying Kwash**
AMPICILLIN 25-50mg/kg 6H IV and GENTAMICIN 6 mg/kg 24H IV or IM for 5 - 7 days. Alternative antibiotics can be used depending on the infection and sensitivities of the organism if isolated or if indicated.

**Sitting Kwash**
AMOXYCILLIN 10-25mg/kg 8H PO for 5-7 days.

6. Helminthiasis
Treat all with MEBENDAZOLE 1 tablet or 5 ml (100 mg) 12H PO for 3 days or ALBENDAZOLE 2 tablets (400mg) stat PO in children over 2 years of age.

7. Immunisations
Check the immunisation status of all children and update if necessary.
Special Issues of concern in children with Severe Malnutrition

Wet Skin Lesions
Very important to dry out. Try gentian violet or Castellani’s Paint daily and expose wet area to the air without freezing the child (“bum-in-the-air” therapy). Use a bedding cradle if it is cold.

There is often a fungal element, and oral FLUCONAZOLE 3 mg/kg 24H PO may be helpful.

Haematological
Ward Hb should be checked on every child. A FBC is helpful but not essential.

1) Anaemia
Many children with severe malnutrition have anaemia. They should not receive blood transfusions because of the risk of fluid overload unless the anaemia is severe (Hb <6g/dl) or is associated with severe infection and / or respiratory tract infections requiring O2. In those cases give 10 – 15ml/kg packed cells over 6 hours. FUROSEMIDE 1 mg/kg IV half way through the blood transfusion may be required but avoid in dehydration.

Give FOLATE 2.5mg 24H PO from admission for the duration of the stay and commence ELEMENTAL IRON at 3 mg/kg 24H PO when the oedema has resolved and the child is improving. Continue iron for approximately 3 months.

2) Thrombocytopaenia
Thrombocytopaenia is often a clue that the child has overwhelming sepsis.

3) Leucocytopaenia
This is also a clue to overwhelming sepsis.

Cardiac Failure
Children with severe malnutrition have a wasted myocardium. Suspect cardiac compromise if the heart size is reduced on CXR (usually a skinny cardiac shadow) and be extra careful to avoid fluid overload. Consider diuretics and inotropic support.

Rehydration
Correct dehydration cautiously as children with severe malnutrition usually have compromised hearts and easily become fluid overloaded and develop cardiac failure, which may kill them. It is preferable to rehydrate orally with standard ORS but if this is not feasible then 1/2 DD at the usual volumes must be used intravenously. Frequent reassessment of hydration is mandatory.

Tuberculosis
Repeat the tine test towards the end of the stay when the child is recovering as an initial negative tine test may reflect the child’s immune status, rather than the absence of TB.

An initial abnormal CXR should be repeated after 2 weeks of a broad-spectrum antibiotic. If the abnormalities persist suspect TB.

Unexpected Death
Unexpected deaths occur towards the end of the first week in apparently improving children, usually in the early hours of the morning. When this occurs, suspect that the child was allowed to get cold or that the child missed a feed and investigate what the nursing practices in your ward are in an attempt to prevent further deaths.

When is a child with Kwashiorkor ready for home?
The inpatient stay is usually about 4 to 6 weeks. The child must be without oedema, gaining weight and be cheerful and interactive.

Plans for home
All the time and effort and money spent on making a child better will be wasted if you do not address the cause of the kwashiorkor, which is usually poverty:

- Discharge the child with sufficient milk for 2 weeks i.e. 2 kg
- Refer the child to the local clinic to receive free milk and weight monitoring (to the Integrated Nutrition Programme)
- Investigate the home circumstances. If poverty caused the malnutrition then assist the mother to apply for the Child Support Grant. If the granny is the caregiver and the parents have absconded or are not taking responsibility for the child then the caregiver can apply for a Foster Grant. If the social circumstances are disastrous then involve a Social Development Worker early to help sort out this problem (NOT on the day of discharge). See also Grants guideline.

Are you making a difference?
Audit your case fatality rate (use Child PIP) for severe malnutrition in your hospital, to see whether what you do makes a difference.

REM eme mber children should not die of malnutrition
CONTENTS OF TRACE ELEMENT MIX
from Red Cross Children’s Hospital: Cape Town

Recipe 1: For Hospitals that are “supply challenged”

- Zinc Sulphate Powder 72g
- Copper Sulphate solution 40ml (1g/200ml)
- Magnesium Sulphate Powder 560g
- Chloroform water as preservative 50ml
- Make up to 2L with water

Usual dose
- 2.5ml 24H under 10 kg and 5 ml 24H over 10kg

Constituents/ml:
- Zinc Sulphate 36mg/ml
- Copper Sulphate 0.1mg/ml
- Magnesium Sulphate 280mg/ml

Recipe 2: For hospitals capable of meeting “supply challenges”

- Zinc Acetate 1.36g
- Copper Sulphate 320mg
- Chromic Chloride 3.6mg
- Manganese Sulphate 96mg
- Selenium Selenite 17.6mg
- Citric Acid 16g
- Sodium Citrate 28g
- Saccharine Sodium 2.64g
- Sodium Cyclamate 5mg
- Rasberry Essence 16ml
- Distilled Water to 4L

Usual Dose:
- 1ml/kg 24H to a max of 20ml/day

Where to obtain constituents:
Zinc Sulphate powder and Copper Sulphate crystals can be bought at any local pharmacy. Magnesium Sulphate Powder is on tender and can be ordered through the normal channels. Chloroform liquid on tender: it needs to be diluted as follows to make Aquae Chlorif Conc - 100ml chloroform, alcohol absolute 60ml, add water to 1 litre. Aquae Chlorif Conc diluted 1: 40 with water will give you chloroform water.

This is quite fiddly and the pharmacist needs to be highly motivated to provide the trace element mix. It should ideally be supplied from the depots. It should be stored in the fridge and will last approximately 1 month.

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