

Severe Malnutrition 1 – Recognition And Early Treatment

- Mortality is often above 30%



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**KENYA
PAEDIATRIC
ASSOCIATION**

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 SAM

	MUAC cm	WHZ
None	>13.5	>-1
At Risk	12.5 to 13.4	-2 to -1
Moderate	11.5 to 12.4	-3 to -2
Severe	<11.5	<-3
	Kwashiorkor	

Advantages of MUAC over WHZscore

- More (in screening) acceptable to children compared to height or weight
- Can be done by one person
- No reference table required, single cut off applied independent of age, sex, height
- Colour-coded tapes
- Not affected by condition that affect weight e. g oedema, dehydration



WEIGHT-FOR-LENGTH FROM BIRTH TO 2 YEARS: BOYS

Length (cm)	-3 SD	-2 SD	-1 SD	Median	1 SD	2 SD	3 SD
64.5	5.6	6.1	6.6	7.1	7.8	8.5	9.3
65.0	5.7	6.2	6.7	7.3	7.9	8.6	9.4
65.5	5.8	6.3	6.8	7.4	8.0	8.7	9.6
66.0	5.9	6.4	6.9	7.5	8.2	8.9	9.7
66.5	6.0	6.5	7.0	7.6	8.3	9.0	9.9
67.0	6.1	6.6	7.1	7.7	8.4	9.2	10.0
67.5	6.2	6.7	7.2	7.9	8.5	9.3	10.2
68.0	6.3	6.8	7.3	8.0	8.7	9.4	10.3
68.5	6.4	6.9	7.5	8.1	8.8	9.6	10.5

MUAC

- MUAC is a better predictor of death than any of the other measurement –H/A, W/A, W/H Score.
- MUAC appears to show consistently better predictive power.
- Correcting MUAC for age or weight is not superior to MUAC alone in predicting mortality.
- Combining MUAC with other anthropometric measurement does not increase the predictive power
- MUAC-based and WHZ-based malnutrition diagnosis correlates poorly. Diagnosis made consistently in 40% of the SAM

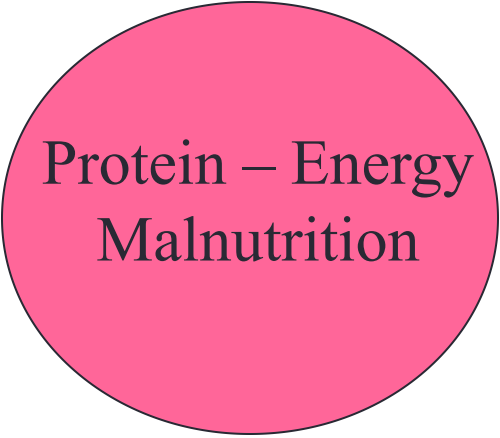
Definitions of Severe Acute Malnutrition

Aged <6 months	Aged 6-59months
WHZ score <-3SD or edema of both feet	MUAC <115 mm or edema of both feet

Indications for hospital admission

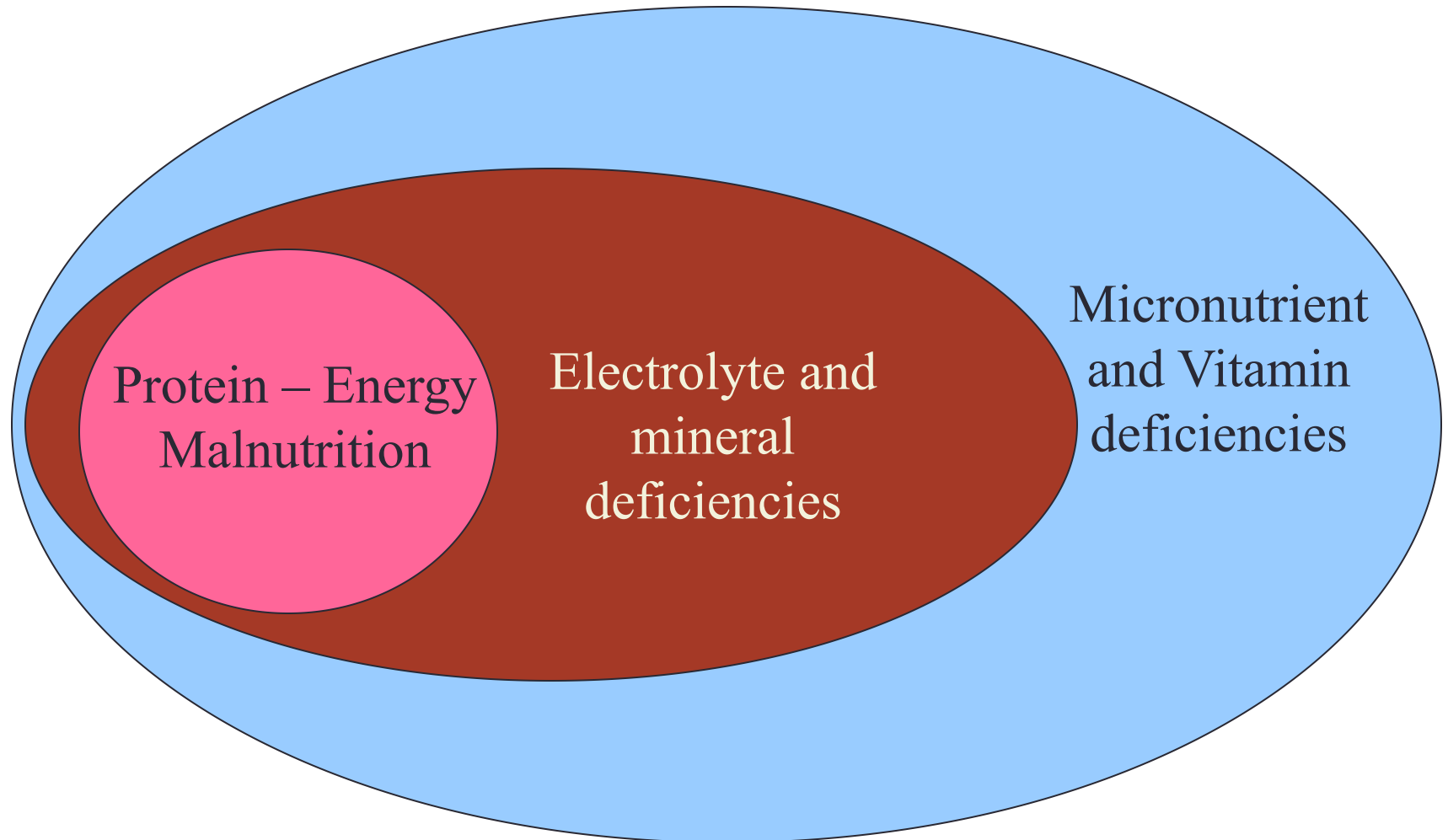
- Medical complications
 - Inadequate breathing
 - Severe or some circulatory compromise
 - Altered consciousness
 - inability to feed
 - Convulsions
- Loss of appetite/unwilling to feed

Severe malnutrition



Protein – Energy
Malnutrition

Severe malnutrition



Electrolyte / Mineral Deficiencies

- Potassium:
 - Potassium supplements help reduce oedema
- Magnesium
- Zinc
- Copper
- Selenium



- **There is too much sodium so salty foods can be dangerous**

Pre-packaged F75 and F100 and Ready to Use Foods (RTUF) have all the 'good vitamins and minerals' – they do not need to be added

What other problems do these children commonly have?



Reductive adaptation in severe acute malnutrition (SAM)

- Body systems slow down in order to survive with limited calories (reductive adaptation)
- SAM causes physiology and metabolic changes in every cell, organ and system requiring the child to be treated differently
- During treatment the systems must be awakened slowly to 'learn' to function again

Reductive adaptation

In severe acute malnutrition energy is conserved by reducing:

- Physical activity and growth
- Basal metabolism by slowing protein turnover
- Functional reserve of organs,
- Number of sodium and potassium pumps in cell membranes and slowing them
- Reducing inflammatory and immune responses

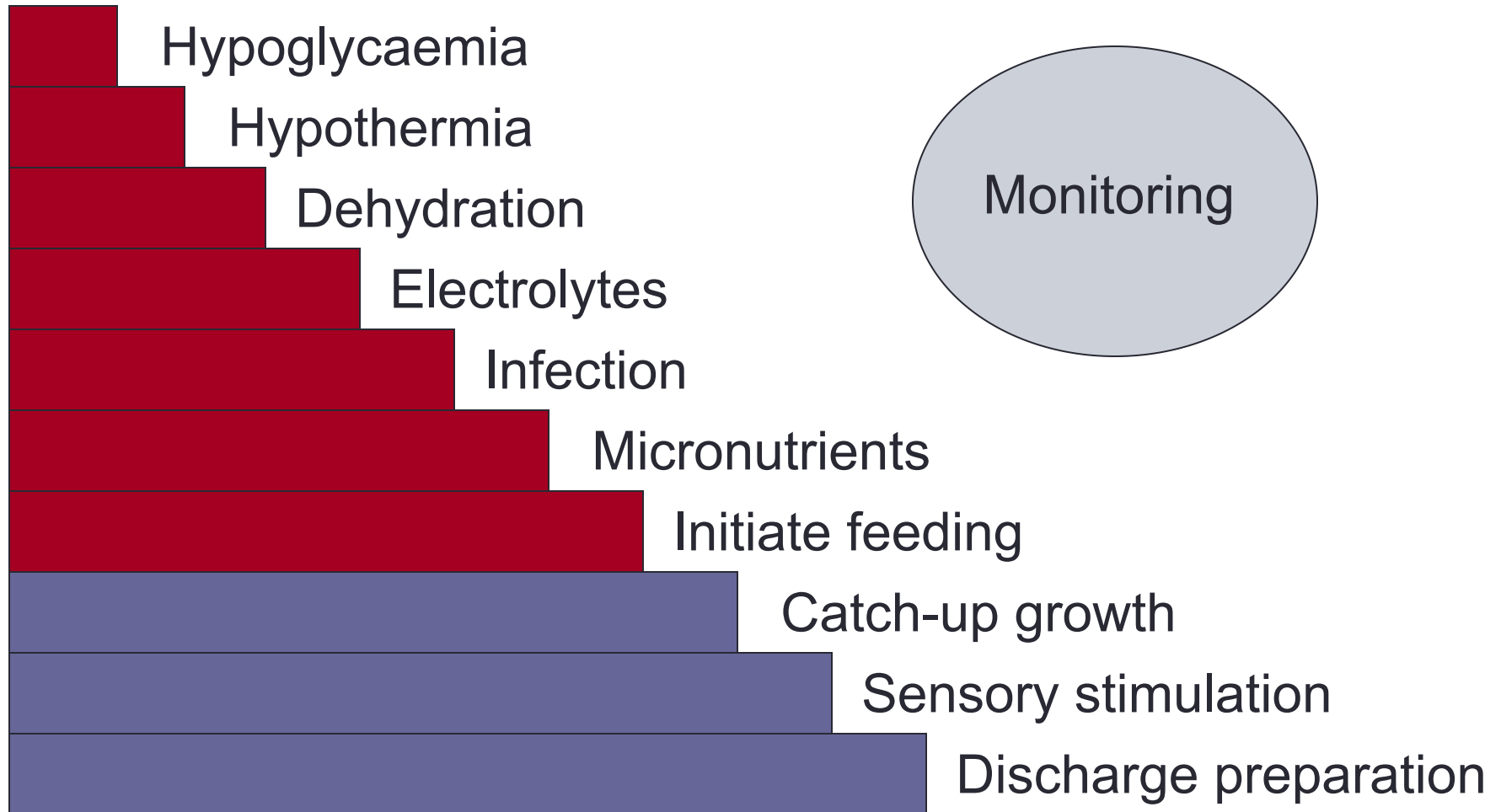
	Effect of reductive adaptation	Action in mnx
Infections.	Body has limited energy to mount local and systemic inflammatory responses eg fever, inflammation	Presume and treat infection in all
Iron	Make less Hb than usual. Unused iron stored. Giving iron early leads to 'free iron'-formation of free radicals & promotes bacterial growth	No supplemental iron during the initial period of treatment.
Sodium & potassium	Na/K pump slows down in SAM. Sodium level in cells rises while potassium leaks out and lost in the urine. Results in high total body sodium & low potassium	Diarrhea – use fluid with ↓Na & ↑K Give foods with Low Na & supplement K

Reduction in function capacity of organs

	Effect of reductive adaptation	Action at the beginning of the treatment
Liver	Less able to make glucose Less able to excrete dietary proteins and toxin	Avoid IVF Calories (100Kcal/kg/day) and proteins (1gm/kg/day) just to meet basic need, sufficient to halt catabolic process and to avoid stress to vital organs and system Increase calorie & protein intake once metabolic machinery & physiology improves.
Kidney	Less able to excrete excess fluid and sodium	
Heart	Smaller and weaker and has reduced output	
Gut	Less acid, small amount of enzymes, villi flattened and motility reduce	

Reduction in functions of major organs - little margin for error.

10 Step Approach



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 $< 3\text{mmol/l}$

Dehydration

- Shock is treated Ringer's / Hartmann's solution with 5% dextrose over two hours.
- Oral rehydration is with RESOMAL.
- Feeding must be introduced during the first 12 hours of treating dehydration, ideally within 4 hrs.

Oral re-hydration in Severe Malnutrition

- Resomal 5ml/kg every 30 mins for 2 hours
 - Simplified to 10mls/kg every hour.
- 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.

Prescription of ReSoMal of 5kg child

Time	ReSoMal	F75
On admission (9am)	50ml	
10am	50ml	
11am	37ml	
12MD		37ml
1pm	37ml	
2pm		37ml
3pm	37ml	
4pm		37ml
5pm	37ml	
6pm		37ml
7pm	37ml	
8pm		37ml

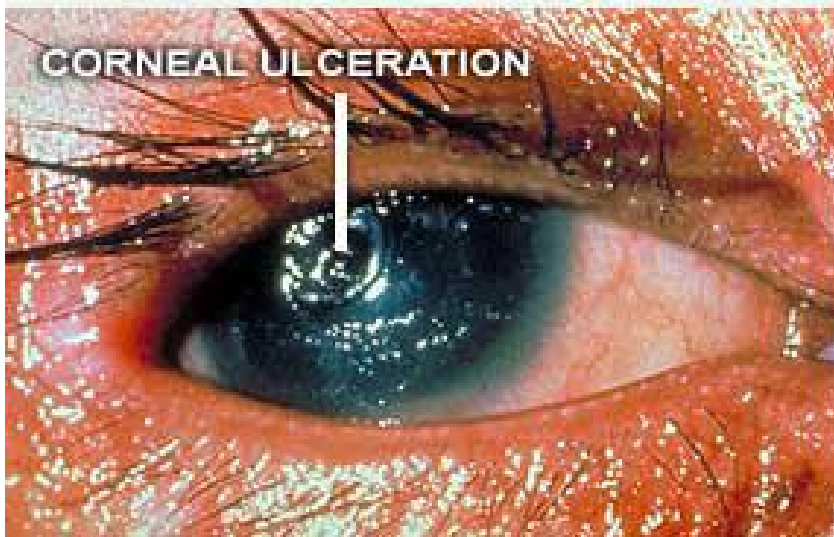
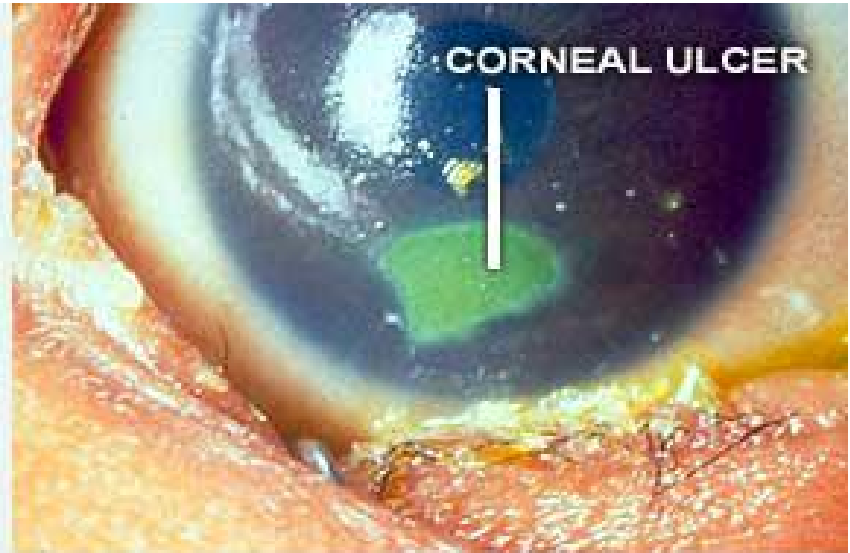
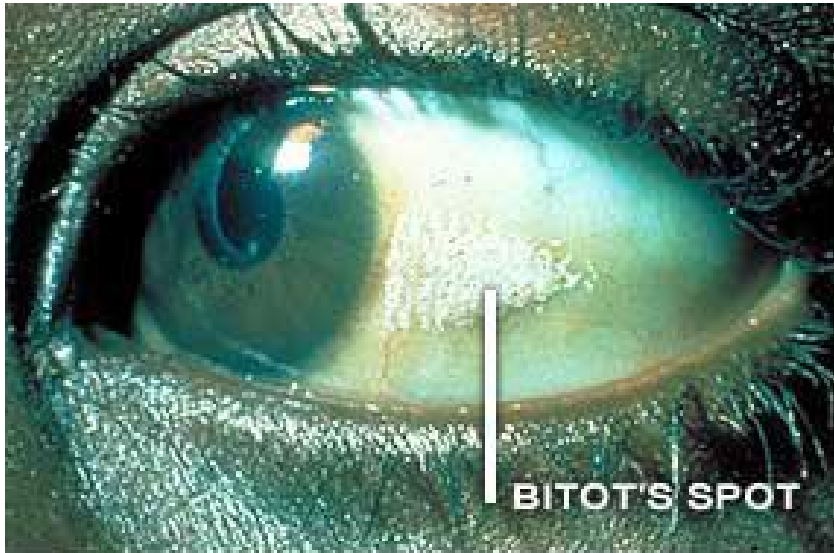
The at 11pm F75 80mls every 3hrly. Give 50mls ReSoMal for every loose stool

Supplemental Zinc not required – ReSOMal & F75/100 contains Zinc

Infection

- Up to 1/3rd children with malnutrition who die have septicaemia / bacteraemia
- Fever and other signs of infection are not helpful in identifying infection in these children
- ALL sick children with severe malnutrition in hospital should be started on :
 - IV/IM Penicillin (or Ampicillin) for 2 days then oral amoxicillin for 5 days and Gentamicin for at least 5 days.
- In addition they receive:
 - Treatment for thrush if present
 - TEO if there are red eyes.
 - Select antibiotics according to suspected infection eg osteomyelitis

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:** high dose vitamin not indicated

QUESTIONS?

Summary.

- The risk of death in children with severe malnutrition is very high.
- Bodies of children with SAM undergo reductive adaptation that affect every cell, organ and system
- The children have many problems and each needs treating.
- The 10 steps approach allows each problem to be treated