



# Management of Medical Complications in Severe Acute Malnutrition (SAM)

CONDITION	IMMEDIATE ACTION	CONDITION	IMMEDIATE ACTION
<b>Severe pneumonia</b>	<p>If the child with SAM has signs of severe pneumonia (central cyanosis, severe respiratory distress, inability to drink or vomiting everything, convulsions, low chest wall indrawing, stridor in a calm child, fast breathing):</p> <ol style="list-style-type: none"> <li>1. Give oxygen, 1–2 litres/minute.</li> <li>2. Keep the child warm.</li> <li>3. Give antibiotics.</li> <li>4. Initiate careful therapeutic feeding by nasogastric (NG) tube.</li> </ol>	<b>Convulsions</b>	<p>If the child with SAM has signs of convulsion:</p> <ol style="list-style-type: none"> <li>1. Give diazepam or paraldehyde rectally.</li> <li>2. Position the unconscious child: turn on the side to reduce the risk of aspiration and stabilise the body position.</li> <li>3. Give sterile 10% glucose 5 ml/kg by IV.</li> </ol>
<b>Shock</b>	<p>If the child with SAM has signs of shock (cold hands with slow capillary refill (longer than 3 seconds) and/or weak or fast pulse) and is lethargic or unconscious:</p> <ol style="list-style-type: none"> <li>1. Give oxygen, 1–2 litres/minute.</li> <li>2. Keep the child warm.</li> <li>3. Give sterile 10% glucose 5 ml/kg IV.</li> <li>4. Give IV fluid at 15 ml/kg over 1 hour, using one of the following solutions in order of preference: <ul style="list-style-type: none"> <li>• Half-strength Darrow's solution with 5% dextrose, or</li> <li>• Ringer's lactate with 5% dextrose* * Add sterile potassium chloride (20 mmol/L).</li> </ul>                     (Or if above not available use half normal saline with 5% glucose*)                 </li> <li>5. Monitor pulse and respiration rates every 10 minutes.</li> <li>6. Give antibiotics.</li> </ol> <p><b>STOP IV if signs of over-hydration that may lead to congestive heart failure:</b> fast breathing, increase in respiratory rate <math>\geq 5</math> breaths/min AND in pulse rate <math>\geq 25</math> beats/min. Other signs of heart failure are: distension of jugular veins, enlarged liver, eyelid oedema, gallop rhythm, fine crackling at the lungs.</p> <p>If there are signs of improvement after the first hour of IV fluid, repeat IV fluid 15 ml/kg over second hour.</p> <p>If there are NO signs of improvement after the first hour of IV fluid, assume child has septic shock. In this case:</p> <ol style="list-style-type: none"> <li>1. Give maintenance fluids 4 ml/kg/hour while waiting for blood.</li> <li>2. Order 10 ml/kg fresh whole blood and when blood is available, stop oral intake and IV fluids.</li> <li>3. Give furosemide 1 ml/kg IV at the start of the transfusion.</li> <li>4. Transfuse whole fresh blood 10 ml/kg slowly over 3 hours. If there are signs of heart failure, give 7 ml/kg packed cells instead of whole blood.</li> </ol>	<b>Dehydration</b>	<p>If the child with SAM and acute diarrhoea or severe vomiting has a sign of dehydration (recent sunken eyes [developed with onset of diarrhoea]), and is <u>not</u> lethargic or unconscious: <b>DO NOT GIVE IV FLUID, but rehydrate orally:</b></p> <ol style="list-style-type: none"> <li>1. Give 10% glucose or sugar water 50 ml (infants 25 ml) orally or by nasogastric tube.</li> <li>2. Give ReSoMal 5 ml/kg every 30 minutes for 2 hours orally (or, if child is too ill, give by NG tube).</li> <li>3. Monitor pulse and respiration rates every 30 minutes during rehydration.</li> <li>4. Then, give ReSoMal 5–10 ml/kg/2-hours in alternate hours with F-75 10 ml/kg/2-hours for up to 10 hours.</li> </ol> <p><b>STOP if signs of hydration:</b> clinically well and alert, normal eyes, tears, moist tongue, drinks normally.</p> <p><b>STOP if signs of over-hydration that may lead to congestive heart failure:</b> fast breathing, increase in respiratory rate <math>\geq 5</math> breaths/min AND pulse rate <math>\geq 25</math> beats/min.</p>
	<p>If the child with SAM has signs of shock, and is <u>not</u> lethargic or unconscious:</p> <ol style="list-style-type: none"> <li>1. Keep the child warm.</li> <li>2. Give 10% glucose 5 ml/kg or 10% glucose or sugar water 50 ml (infants 25 ml) orally or by nasogastric tube.</li> <li>3. Give antibiotics.</li> <li>4. Proceed immediately to full assessment, treatment and initiate oral or NG feeding with F-75</li> </ol>	<b>Blinding eye signs</b>	<p>If the child with SAM has corneal clouding or ulceration:</p> <ol style="list-style-type: none"> <li>1. Give vitamin A immediately (&lt; 6 months 50,000 IU, 6–12 months 100,000 IU, &gt; 12 months 200,000 IU) and repeat on day 2 and day 15.</li> <li>2. For corneal ulceration, instil 1 drop of atropine (1%) into affected eyes for pain and prevent the lens from pushing out.</li> <li>3. Put chloramphenicol eye drops every 3 hours or tetracycline eye ointment every 4 hours and bandaging when child is stable.</li> </ol>
<b>Hypoglycaemia</b>	<p>If the child with SAM has hypoglycaemia (blood glucose &lt; 3 mmol/L or &lt; 54 mg/dl):</p> <ol style="list-style-type: none"> <li>1. Give sterile 10% glucose 5 ml/kg IV, then 10% glucose or sugar water 50 ml (infants 25 ml) by NG tube, or what is first available.</li> <li>2. Keep the child warm.</li> <li>3. Give antibiotics.</li> <li>4. Start feeding with F-75.</li> </ol>	<b>Blinding eye signs</b>	<p>If the child with SAM has corneal clouding or ulceration:</p> <ol style="list-style-type: none"> <li>1. Give vitamin A immediately (&lt; 6 months 50,000 IU, 6–12 months 100,000 IU, &gt; 12 months 200,000 IU) and repeat on day 2 and day 15.</li> <li>2. For corneal ulceration, instil 1 drop of atropine (1%) into affected eyes for pain and prevent the lens from pushing out.</li> <li>3. Put chloramphenicol eye drops every 3 hours or tetracycline eye ointment every 4 hours and bandaging when child is stable.</li> </ol>
<b>Hypothermia</b>	<p>If the child with SAM has signs of hypothermia (&lt;35°C axillary or &lt;35.5°C rectal temperature):</p> <ol style="list-style-type: none"> <li>1. Warm the child.</li> <li>2. Give sterile 10% glucose 5 ml/kg IV or 10% glucose or sugar water 50 ml (infants 25 ml) by NG tube.</li> <li>3. Give antibiotics.</li> <li>4. Start feeding with F-75.</li> </ol>	<b>Severe anaemia</b>	<p>If the child with SAM has very severe anaemia (Hb &lt;4 g/dl or &lt;6 g/dl and respiratory distress), a blood transfusion is required:</p> <ol style="list-style-type: none"> <li>1. Give whole fresh blood 10 ml/kg body weight slowly over 3 hours. If there are signs of anaemic heart failure, give 7 ml/kg packed cells over 3 hours rather than whole blood.</li> <li>2. Stop all oral intake and IV fluids during the transfusion.</li> <li>3. Give furosemide 1 ml/kg IV at the start of the transfusion.</li> </ol>
		<b>Congestive heart failure</b>	<p>If the child with SAM develops signs of fluid overload or heart failure during rehydration (first sign is fast breathing; other danger signs are increase in respiratory rate <math>\geq 5</math> breaths/min and in pulse rate <math>\geq 25</math> beats/min, distension of jugular veins, enlarged liver, eyelid oedema, gallop rhythm, fine crackling at lungs):</p> <ol style="list-style-type: none"> <li>1. Stop all intake of food. Stop all IV fluid. Do not give any fluid until the heart failure has improved.</li> <li>2. Give furosemide, 1 mg/kg IV. Monitor the child closely when giving furosemide and reassess the child.</li> <li>3. Give digoxin, 15 <math>\mu</math>g/kg IV only if diagnosis of heart failure is unmistakable (elevated jugular venous pressure).</li> </ol>



## Monitoring Danger Signs in Inpatient Management of Severe Acute Malnutrition (SAM)

Vital signs*	Normal Ranges	Danger Signs	Danger sign could suggest:
Appetite	Good appetite is eating well, asking for more, passing observed RUTF appetite test	Anorexia, appetite loss, no re-gain of appetite after stabilisation treatment	Failure to respond to treatment, infection
Blood glucose	≥ 3 mmol/L or ≥ 54 mg/dl	< 3 mmol/L or < 54 mg/dl; Sleeping with eyelids open	Hypoglycaemia
Cold extremities	None	Cold hands (check with back of the hand) with capillary refill longer than 3 seconds and/or weak and fast pulse	Shock
Haemoglobin (Hg)	≥ 4 g/dl or ≥ 6 g/dl with respiratory distress	Severe pallor; Hg < 4 g/dl or < 6 g/dl with respiratory distress	Severe anaemia, anaemic heart failure
Mental state	Clinically well and alert	Change in mental state, drowsy, lethargic, unconscious	Shock, failure to respond to treatment, severe infection
Oedema	None	New oedema, eyelid oedema (puffy eyes), increasing oedema	Fluid overload, no response to treatment
Pulse rate	0–2 months: Pulse 80–160 beats/minute 2–12 months: Pulse 80–160 beats/minute 12–60 months: Pulse 80–140 beats/minute	Increase in pulse rate of ≥ 25 beats/minute	Many reasons, including crying and fear
Respiration rate	0–2 months: < 60 breaths/minute** 2–12 months: < 50 breaths/minute** 12–59 months: < 40 breaths/minute	Fast breathing (0–2 months ≥ 60 breaths/minute; 2–12 months: ≥ 50 breaths/minute; 12–59 months: ≥ 40 breaths/minute), difficult laboured breathing	Fast breathing: pneumonia
Pulse AND respiration rate	See above	Increase in pulse rate of ≥ 25 beats/minute <i>and</i> increase in respiratory rate of ≥ 5 breaths/minute (Other signs: enlarged liver, distension jugular veins, eyelid oedema, gallop rhythm, fine crackling at lungs)	Congestive heart failure from overhydration, too fast rehydration; infection
Stool	Normal stool (< 3 loose stools per day)	Fluid loss by 3 or more loose stools per day, and recent sunken eyes, watery, mucoid or bloody diarrhoea; Persistent diarrhoea (for > 14 days)	Dehydration, infection; osmotic or lactase diarrhoea
Temperature	Axillary temperature ≥ 35.0°C and < 37.5°C (rectal temp. readings are 0.5°C higher)	Any sudden increase or decrease in temperature, very low < 35.0°C or very high ≥ 38.5°C temperature	Infection; hypothermia (child being uncovered, missed feed)
Urine	Normal	Increased frequency of passing urine, pain on passing urine, no passing urine, positive dipstick	Urinary tract infection
Vomiting	None	Fluid loss by severe vomiting, and recent sunken eyes	Dehydration
Weight and weight gain	See WHO growth and weight velocity charts	Weight loss (in the absence of oedema), weight gain during stabilisation (in the absence of rehydration), static weight during rehabilitation, large weight changes	Failure to respond to treatment

\* Other danger signs to watch for, e.g., cyanosis, convulsions, petechiae (bruising) or purpura, abdominal distension, jaundice.

\*\* Infants < 12 months will normally breath fast without having pneumonia. Unless the infant's normal respiratory rate is known to be high, assume either overhydration or pneumonia. Careful evaluation and taking into account prior fluid administration will help differentiate the two conditions and plan appropriate treatment. Infants < 2 months may have normal periods of apnoea.



# 10 Steps Protocol for Inpatient Care Management of Severe Acute Malnutrition (SAM)

STEP	PREVENTION	WARNING SIGNS	IMMEDIATE ACTION
<b>1. TREAT OR PREVENT HYPOGLYCAEMIA</b> <i>(Low blood sugar)</i>  Hypoglycaemia is a blood glucose < 3 mmol/L	For all children: 1. Feed straightaway and then every 2–3 hours, day and night. 2. Encourage the mothers to watch for any deterioration, help feed and keep child warm.	1. Low temperature (hypothermia) noted on routine check. 2. Lethargy, limpness and loss of consciousness. 3. Child can become drowsy. 4. Retraction of eyelids. Child sleeping with half-open eyes.	Test for glucose level on admission, before giving glucose or feeding. <b>If hypoglycaemia is suspected and no test is available or if it is not possible to get enough blood for test, assume that the child has hypoglycaemia and give treatment immediately without laboratory confirmation.</b> <b>If conscious:</b> 1. Give a bolus of 10% glucose (50 ml) or sugar solution (1 rounded teaspoon sugar in 3 tablespoons of water). Bolus of 10% glucose is best, but give sugar solution or F-75 formula rather than wait for glucose. 2. Start feeding straightaway: Feed 2-hourly (12 feeds in 24 hours). Use feed chart to find amount to give and feed every 2–3 hours day and night. <b>If unconscious,</b> give glucose IV (5 ml/kg of sterile 10% glucose), followed by 50 ml of 10% glucose or sucrose by NG tube.
<b>2. TREAT OR PREVENT HYPOTHERMIA</b> <i>(Low temperature)</i>  Hypothermia is a rectal temperature <35.5°C (95.9°F) or an underarm temperature <35°C (95°F).	For all children: 1. Feed straightaway and then every 2–3 hours, day and night. 2. Keep warm. 3. Use the kangaroo technique, cover with a blanket. Let mother sleep with child to keep child warm. 4. Keep room warm, no draughts. 5. Keep bedding/clothes dry. Dry carefully after bathing (do not bathe if very ill). 6. Avoid exposure during examinations, bathing. 7. Use a heater or incandescent lamp with caution, <b>do not use</b> hot bottle water or fluorescent lamp.	Low temperature  NOTE: Hypothermia in malnourished children often indicates coexisting hypoglycaemia and serious infection.	Take rectal temperature on admission. (Ensure thermometer is well shaken down). <b>If the rectal temperature is below 35.5°C:</b> 1. Feed straightaway (or start rehydration if needed). 2. Re-warm. Put the child on the mother's bare chest (skin to skin contact) and cover them, OR clothe the child, including the head, cover with a warmed blanket and place a heater or lamp nearby. 3. Feed 2-hourly (12 feeds in 24 hours). <b>Monitor during re-warming</b> > Take temperature every 2 hours: stop re-warming when it rises above 36.5°C > Take every 30 minutes if heater is used because the child may become overheated.
<b>3. TREAT OR PREVENT DEHYDRATION</b> <i>(Too little fluid in the body)</i>	When a child has watery diarrhoea, give ReSoMal between feeds after each loose stool. As a guide, give 50 ml–100 ml after each watery stool if child is aged < 2 years, or 100 ml–200 ml if aged 2 years or older.	Profuse watery diarrhoea, thirst, hypothermia, sunken eyes, weak or absent radial pulse, cold hands and feet, reduced urine output.	DO NOT GIVE IV FLUIDS EXCEPT IN SHOCK (see separate protocol for treating shock) <b>If dehydrated:</b> 1. Give ReSoMal 5 ml/kg every 30 minutes for 2 hours (orally or by nasogastric tube) 2. Then give 5–10ml/kg in alternate hours for up to 10 hours (i.e., give ReSoMal and F-75 formula in alternate hours). Use Initial Management Chart. 3. Stop ReSoMal when there are three or more hydration signs, or signs of over-hydration. <b>Monitor during rehydration for signs of over-hydration:</b> > increasing pulse and respiratory rate > increasing oedema and puffy eyelids Check for signs at least hourly. Stop if pulse increases by 25 beats/minute and respiratory rate by 5 breaths/minute.
<b>4. CORRECT ELECTROLYTE IMBALANCE</b> <i>(Too little potassium and magnesium, and too much sodium)</i>	1. Use ReSoMal and F-75 formula as these are low in sodium. 2. Do not add salt to food introduced during the rehabilitation phase.	Oedema develops or worsens.	<b>Follow feeding recommendation, as well as recommendation or prevention or treatment of dehydration:</b> Extra potassium (4 mmol/kg body weight) and magnesium (0.6 mmol/kg) are important. <b>For potassium,</b> add CMV or electrolyte/mineral solution or 10% potassium chloride solution to feeds and to prepare ReSoMal. If these are unavailable, give crushed Slow K ½ tablet/kg body weight daily. <b>For magnesium,</b> add CMV or electrolyte/mineral solution to feeds and to ReSoMal. <b>NOTE: Potassium and magnesium are already added in ready-to-dilute F-75 and F-100 packets. They are also in CMV.</b>
<b>5. TREAT INFECTIONS</b>	1. Keep malnutrition ward in a separate room. 2. Reduce overcrowding if possible. 3. Wash hands before preparing feeds and before and after dealing with any child. 4. Give measles vaccine to unimmunised children over 6 months of age. 5. Give good nursing care.	NOTE: The usual signs of infection, such as fever, are often absent so <b>assume all</b> children with SAM have infection and treat with antibiotics.  Hypothermia and hypoglycaemia are signs of severe infection.  NOTE: Ensure all doses are given. Give them on time.	<b>Starting on the first day, give broad-spectrum antibiotics* to all children.</b> 1. <b>If the child has no complications,</b> give: Amoxicillin 15 mg/kg 8-hourly for 5 days <b>OR</b> 2. <b>If the child is severely ill</b> (apathetic, lethargic) or has complications (hypoglycaemia, hypothermia, raw skin/fissures, respiratory tract or urinary tract infection) give IV/IM benzylpenicillin AND gentamicin. > Benzylpenicillin: 50,000 IU/kg IM/IV 6-hourly for 2 days, then oral amoxicillin 15 mg/kg 8-hourly for 5 days AND > Gentamicin: 7.5 mg/kg IM/IV once daily for 7 days. <b>If resistance to amoxicillin and benzylpenicillin, and presence of medical complications</b> > In the case of <b>sepsis or septic shock,</b> give: IV/IM cefotaxime (children or infants over 1 month of age (50 mg/kg every 8–12 hours) + oral/IV ciprofloxacin (5–15 mg/kg 2 times per day). > If <b>suspected staphylococcal infections,</b> add: IV/IM cloxacillin (12.5–50.0 mg/kg/dose four times a day, depending on the severity of the infection) <b>If no improvement after 48 hours</b> > CEFTRIAXONE 100 mg/kg IV or IM once a day for 5 days (Infants <3 kg: 50 mg/kg) If specific infections are identified that require specific antibiotic not already being given, give additional antibiotic to address the infection according to the Malawi Standard Treatment Guidelines (MSTG). <b>For parasitic worms (helminthiasis, whipworm):</b> treatment should be delayed until the child is in outpatient care. Anti- <b>helminthiasis should only be given to children &gt; 24 months.</b> For children over 2 years: Give Albendazole (400 mg, single dose) and Mebendazole 100 mg orally twice a day for three days.
STEP	MANAGEMENT		
<b>6. CORRECT MICRONUTRIENT DEFICIENCIES</b>	1. <b>Give Vitamin A</b> a. <b>Preventive dose:</b> Give vitamin A single dose on the fourth week during treatment or upon admission if the child has not received in the past 1 month. If under 6 months give 50,000 units; if 6–11 months give 100,000 units; and if > 12 months give 200,000 units. b. <b>Treatment dose:</b> Give vitamin A on day 1, 2 and 15 if the child has any signs. If under 6 months give 50,000 units; if 6–11 months give 100,000 units; and if >12 months give 200,000 units. <b>Give the following daily:</b> 2. Folic acid: 5 mg on day 1; then 1 mg daily <b>ONLY if CMV</b> is not included in the feeds. 3. Multivitamin syrup 5 ml <b>ONLY if CMV not</b> included in the feeds. 4. Zinc (2 mg/kg body weight) and copper (0.3 mg/kg body weight) <b>ONLY if CMV is not</b> included in the feeds 5. Start iron (3 mg/kg/day) after 2 days on F100 catch-up formula. ( <b>Do not give iron in the stabilisation phase and do not give iron if child is receiving RUTF.</b> ) <b>NOTE: Vitamin A, folic acid, multivitamins, zinc and copper are already added in F-75 and F-100 packets. They are also in CMV.</b>		
<b>7. BEGIN CAUTIOUS FEEDING</b> Stabilization phase and transition phase	<b>Stabilisation phase:</b> 1. Give F-75 formula (see feed chart for amounts). These provide 130 ml/kg/day. 2. Give 8–12 feeds over 24 hours 3. If the child has oedema +++, reduce the volume to 100 ml/kg/day (see feed chart for amounts) 4. If the child has poor appetite, encourage the mother to coax and support the child finishing the feed. If eating 80% or less of the amount offered for two consecutive feeds, use a nasogastric tube. If in doubt, see feed chart for intakes below which tube feeding is needed. 5. Keep a 24-Hour Intake Chart. Measure feeds carefully. Record leftovers. 6. If the child is breastfed, encourage continued breastfeeding but also give F-75. 7. Transfer to RUTF as soon as appetite has returned (usually within one week) and oedema has been lost or is reduced. 8. Weigh daily and plot weight.	<b>Transition phase:</b> 1. Introduce RUTF: > Test for appetite using RUTF. Offer plenty of potable water to drink. > If the child passes the appetite test, continue feeds with RUTF, based on 150 kcal/kg/day. > If the child does not pass the RUTF appetite test, continue with F-75 but repeat the appetite test at every feed. 2. If the child is breastfed, continued breastfeeding. 3. Weigh daily and plot weight. (The child should not gain more than 5 g/kg/day.) 4. When the child is able to eat at least 75% of the RUTF, observe the child for 24 hours to ensure he/she is able to eat the daily amount of RUTF. If the child is clinically well and alert and the oedema is reducing, refer the child to outpatient care for continuing treatment.	
<b>8. INCREASE FEEDING TO RECOVER WEIGHT LOSS: "CATCH-UP GROWTH"</b> Rehabilitation phase	<b>Rehabilitation Phase (Majority of the children referred to outpatient care)</b> 1. Give 6 feeds over 24 hours. Ready-to-use therapeutic food (RUTF) should be given if the child is being referred to outpatient care. 2. The mother should encourage the child to eat as much as possible, so the child can gain weight rapidly. 3. The child receives follow-on visits every week or 2 weeks at the nearest health facility providing outpatient care services <b>For the few special cases who cannot tolerate RUTF, F-100 is used during rehabilitation phase, Children on F-100 should continue with care in the inpatient care until they attain the discharge criteria. F-100 must never be given to take home.</b>		
<b>9. STIMULATE EMOTIONAL AND SENSORIAL DEVELOPMENT</b> Loving care, play and stimulation	1. Provide tender loving care 2. Help and encourage mothers to comfort, feed, and play with their children. 3. Give structured play when the child is well enough.		
<b>10. PREPARE FOR DISCHARGE AND FOLLOW-UP IN THE OUTPATIENT CARE</b>	1. Obtain information on family background and socio-economic status. 2. Inform the mother of the closest health facility providing outpatient care to her home and give the mother a weekly ration of RUTF enough until her next visit to the outpatient care. 3. Establish a link with community health workers for home follow-up while in the outpatient care. 4. Write full clinical summary in child's Critical Care Pathway (CCP) outcome page and referral form from inpatient care to outpatient care. 5. Send a referral form to the health facility providing outpatient care services.		

