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University

**"MANAGEMENT OF SEVERE ACUTE MALNUTRITION IN
CHILDREN AGES 6 MONTHS TO 5 YEARS AT BANGLADESH SISHU
HOSPITAL AND INSTITUTE."**

AN INTERNSHIP REPORT

BY

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Submitted to the Department of Nutrition and Food Engineering in the partial fulfillment of
B.Sc. in Nutrition and Food Engineering.

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CERTIFICATE OF APPROVAL

With great pleasure, I announce the successful submission of Tasmiah Tabassum Mim's internship report (student ID: 192-34-958) for presentation and defense/viva-voce at the Department of Nutrition and Food Engineering. Under Ms. Effat Ara Jahan's guidance, Tasmiah Tabassum Mim worked hard to accomplish her internship at Dhaka Sishu Hospital.

It is noteworthy to mention that the findings and content of the report genuinely reflect Tasmiah Tabassum Mim's own efforts and research. I recommend her report for further academic review and suggest it be subjected to a formal defense or oral examination. Tasmiah Tabassum Mim has demonstrated commendable ethical integrity and has been an outstanding individual to work with. Her hardworking and pleasant nature has indeed made the experience rewarding. I sincerely wish her all the best in her future endeavors.

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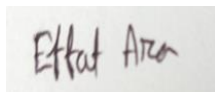
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DECLARATION

This declaration certifies that Ms. Effat Ara Jahan, Assistant Professor, Department of Nutrition and Food Engineering, Daffodil International University, oversaw the internship "Management of Severe Acute Malnutrition in Children Ages 6 Months to 5 Years at Bangladesh Sishu Hospital and Institute." I additionally certify that no portion of this report or internship has been submitted for consideration for a degree or certificate elsewhere.

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I am also thankful to all the staff members of the NFE department for their support and assistance throughout my four years at the university.

Lastly, I'm grateful to my peers, juniors, and seniors for their insights, and companionship, all of which have been immensely helpful to me.

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EXECUTIVE SUMMARY

This internship report presents a comprehensive analysis of the nutritional assessments conducted at Bangladesh Sishu Hospital and Institute (BSHI) focusing on the management of severe acute malnutrition (SAM) in children aged 6 months to 5 years. SAM remains a significant public health issue in Bangladesh, particularly in this age group. BSHI is committed to delivering high-quality medical care to children, with a special emphasis on combating SAM. This executive summary highlights the primary methods and recommendations for effectively tackling SAM at BSHI within a one-year timeframe. SAM is a major contributor to child illness and death in the region. One of the challenges BSHI faces is the prompt recognition and treatment of SAM due to limited resources and coordination. The report suggests several strategies: Initiate a community outreach initiative to increase awareness of SAM and facilitate early detection. Train local healthcare workers to identify signs of SAM and ensure timely referrals to BSHI. Implement systematic growth monitoring at primary healthcare centers and within the community. Organize ongoing training for medical staff on managing SAM, incorporating current guidelines and practices. Ensure BSHI has a specialized team comprising nutritionists, pediatricians, and nurses dedicated to SAM treatment. Collaborate with local universities and organizations for ongoing staff development. Involve parents and caregivers in treatment, offering nutritional education. Create caregiver support groups for experience and knowledge exchange. Launch community-based campaigns to educate on nutrition and child health. Effective handling of SAM at BSHI is crucial to alleviate the SAM burden in Bangladesh. The execution of these strategies and recommendations could lead to significant improvements in managing this critical health concern over the course of a year, enhancing children's health in the region. Success hinges on sustained dedication, monitoring, and community engagement in this endeavor.

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CHAPTER 1

INTRODUCTION

1.1. The founding of the Bangladesh Shishu Hospital and Institute (BSHI)/(DHS).

Bangladesh Shishu (Children) Hospital, a beacon of pediatric healthcare in Bangladesh, stands as the nation's most extensive facility dedicated to children's medical needs. This third-level hospital, funded by the government, began its journey in March 1972, emerging just after Bangladesh's emergence as a sovereign nation from British rule. Initially, it was nestled in a humble private house in Dhanmondi, Dhaka, featuring 50 beds for inpatient care. This initiative was bolstered by support from the Bangladesh government and an alliance of charitable organizations. Simultaneously, its outpatient services commenced under modest conditions in a tent in the nearby locality of Sukrabad, with backing from 'World Vision, Bangladesh' and 'Save the Children Fund, UK' -based supporters.

In a pivotal move, the National Economic Council (NEC) of the People's Republic of Bangladesh, guided by the visionary leadership of Bangabandhu Sheikh Mujibur Rahman, affectionately known as the "Father of the Nation," approved a visionary project in December 1974. This project aimed to establish a 250-bed children's hospital with a scalable capacity of up to 650 beds. In March 1975, under the auspices of the Ministry of Health and Family Welfare, Bangladesh, the project's location shifted to a more suitable location in Dhaka's Sher-e-Bangla Nagar, Shyamoli.

By June 1977, the Bangladesh Shishu Hospital proudly commenced its operations at this new venue. The construction was financially supported through government grants and the Bangladesh Shishu Hospital trust fund, which was a melting pot of public generosity, including donations, revenue from two public lotteries, and cultural events. A special committee was formed by the Ministry of Health and Family Welfare in Bangladesh to supervise the building, ensuring that the hospital's development was on track. Prof. Tofayel Ahmed, the hospital's founding member and secretary, was a pivotal player throughout this time. He was instrumental in the building committee until his passing in 2010. Marking a new era in pediatric care, on January 17, 2012, the honorable Prime Minister Sheikh Hasina laid the cornerstone for a new nine-story hospital wing. This ceremonious occasion also saw the inauguration of the nation's first Pediatric Cardiac Centre, a state-of-the-art facility featuring a Cath lab, an emergency care unit, and specialized cardiac surgery capabilities.

1.2. Vision and Mission

To address the growing demand in the Outpatient Department (OPD), the vision and mission include several expansion and development plans. The Outpatient Department (OPD) is facing an urgent need for expansion to accommodate the increasing patient influx. To address this, the plan involves enlarging the existing OPD space, ensuring it can efficiently manage the

growing patient numbers. This expansion will not only improve patient care but also streamline the workflow for medical professionals.

Certainly, the vision and mission can be outlined as follows:

- Expansion of hospital beds to accommodate the increasing patient load.
- Development of advanced medical services including Interventional Cardiology and Cardiothoracic Surgery.
- Construction of a dedicated block for the Bangladesh Institute of Child Health (BICH).
- Extending lodging options for residential staff members who work full-time.
- The introduction of DNA analysis services and bonemarrow transplantation.
- Offering staff transportation options.

CHAPTER 2

SETTING OF INTERNSHIP EXPERIENCE

2.1. Internship Program

In cases of severe acute malnutrition, there's a significant disparity between the nutritional intake and the actual dietary needs of individuals, often due to insufficient amounts and quality of vital nutrients and vitamins. A considerable portion of the population, over 50%, suffers from malnutrition. Specifically, around 2 million children experience mild acute malnutrition, and approximately 450,000 children are afflicted with severe acute malnutrition. An alarming 52% of children under five years old are impacted by anemia. Furthermore, 41% of children in this age group exhibit rigid movements. As many as 16% of children under five are experiencing wasting, while 36% are underweight. Among women, 25% are underweight, and roughly 15% have short stature, factors that increase the risk of difficult labor and giving birth to low-weight infants. Additionally, half of all women suffer from anemia, primarily due to dietary deficiencies. The economic impact of malnutrition on Bangladesh is substantial, with over \$1 billion lost annually in productivity. Addressing this critical issue, the goal of Dhaka Sishu Hospital is to lower the incidence of extreme hunger.

2.2. The Paper's Opening

The internship represents the culminating experience of a university student's academic journey. This particular internship program is a testament to the hard work and successful performance in our academic and professional pursuits at university. For students specializing in nutrition and food engineering, practical training in a clinical or food industry setting is essential to fully grasp the concepts taught in the classroom. Undertaking hospital duties is a crucial part of this training, applying the theoretical knowledge acquired in university to real-world scenarios. This internship presents a unique learning opportunity for me. The practical aspects of modern food and health management are often quite distinct from the university curriculum. The coursework for the B.Sc. program in Nutrition and Food Engineering is in line with this initiative, focusing on studying severe acute malnutrition in children aged between 6 months and 5 years. My tenure at Bangladesh Sishu Hospital and Institute (BSHI) provided me with exposure to their protocols in pediatric gastroenterology, hepatology, and nutrition, where patients receive proficient care.

My respected university supervisor, Ms. Effat Ara Jahan, guided me to approach this internship with the diligence of a regular student. The research and study I undertake will center on the critical issue of malnourishment severe and acute in children six months to five years of age.

2.3. The Training Experience's aims

This internship aims to align with the academic benchmarks of the B.Sc. in Nutrition and Food Engineering program, tasking you with the critical analysis of how factual data translates into actionable insights and experiential knowledge. The internship program presents an opportunity to earn up to three academic credits. A key aspect of this program is to gain a preliminary understanding of the immediate health challenges faced by children suffering from severe acute malnutrition (SAM). This understanding is vital for achieving the primary objective of the internship, which is to enhance the health of children affected by SAM through the practical application of theories and concepts learned in the classroom.

A significant portion of this study delves into the awareness, or lack thereof, among parents regarding the causes of SAM in their children. Numerous factors contribute to this lack of awareness, including improper hand hygiene, consumption of contaminated water, poor sanitation, unhealthy dietary choices, limited nutritional knowledge, inadequate practices in exclusive breastfeeding, lack of vaccination awareness, and a general unawareness of environmental and familial lifestyle factors. This research aims to bridge these gaps in knowledge and practice, contributing to the broader goal of improving child health outcomes in the context of SAM.

CHAPTER 3

MAIN ACTIVITIES

3.1. Operational Roles

In this section, I describe my professional role and responsibilities. I secured a position in the Department of Pediatric Gastroenterology and Hepatology at Dhaka Shishu Hospital (DSH), also known in some circles as the Nutrition Division. The primary focus of this department is addressing issues related to nutritional deficiencies. Malnutrition is a leading cause of morbidity and mortality among children aged six months to five years, particularly in economically disadvantaged countries like Bangladesh. However, it is a preventable condition. The key responsibilities of this department include conducting research, providing education, and delivering clinical services.

Punctuality is essential in our department. We are expected to be present at the workplace by 8:00 AM and commence our duties at 8:30 AM. Our regular work schedule runs from Saturday to Thursday, beginning at 8:30 AM and concluding at 1:00 PM each day.

3.2. Medical Examinations and Rounds

Our work on various projects commences following the initial meeting of the day. After a brief catch-up session, the educational activities start at 9:00 AM. At Dhaka Shishu Hospital (DSH), nurses conduct basic health assessments of the children, including measurements of their height, weight, and overall health. Subsequently, there is close monitoring of the patients' dietary intake. Every morning, assessments are made to ensure the children are meeting their nutritional targets, with necessary adjustments made to their diet plans if required.

On follow-up visits, the dietician and nutritionist evaluate the kids' nutritional progress. Following admission to a therapeutic program, the team provides a comprehensive care package that includes clinical treatment, dietary management, counseling, as well as ongoing and long-term follow-up. For new patients, their caregivers or mothers provide essential details to the DSH medical team, such as the child's age, date of birth, weight, height, and current health status. Based on this information, the dietician formulates a tailored nutritional plan. After a thorough review, the DSH dietician briefs us on these plans. Each day, the dietician imparts new knowledge about managing facility-based nutrition programs during these sessions, which typically last about an hour.

The rounds start at 11 AM, during which we learn to assess the children's health status and determine appropriate treatments or dietary adjustments according to their individual needs. These rounds also serve as an opportunity to review and reflect on the effectiveness of our

previous interventions. Below are images from the follow-up sessions and round-table meetings



During Round Session and patients' medical examinations

3.3. Familiarization with superiors

In my role as a dietary assistant within the hospital, My supervisors are senior nutritionist Sabrina Makbul and qualified dietitian Shanta Roy. On a daily basis, our division attends to approximately 10–20 individuals seeking dietary consultations. Our responsibilities in the follow-up division commence here, focusing on the implementation of new nutritional plans for the day and monitoring the growth and development of the children. My supervisors engage in a diverse array of activities, encompassing research, training, educational initiatives, and the provision of medical advice.

3.4. Care and treatment of patients

Children suffering from severe acute malnutrition (SAM) and moderate acute malnutrition (MAM) often present with a range of health complications including asthma, diarrhea, dysentery, vitamin shortages, dermatosis, infections of different kinds, renal illnesses, and

specific cardiac and neurological disorders. Dietitians and nutritionists play a crucial role in these patients' care, providing guidance on healthy eating, nutritional education, and developing tailored nutritional plans for children. Our mentors extensively train us in food management techniques, including the preparation and administration of therapeutic foods such as F-75 and F-100 formulas. Additionally, we consider other dietary elements like basic nutrition, chicken soup, rice, Oral Rehydration Solution (ORS), and Resomal. A specialized feeding regimen is formulated to facilitate the children's recovery from their critical health conditions, maintaining their nutritional status, which is vital during the recuperative and healing phases of their treatment.

The responsibility of managing these dietary plans falls under the purview of dietitians. Once the children begin to recover, they are served meals prepared by the ward staff. Outpatient visits also include consultations where parents receive advice on optimal dietary choices for their children. Dietary support is available beyond regular hours, ensuring continuous care. Our learning process involves assimilating information from various sources and terminologies. Additionally, we extend our services to other wards, including but not limited to wards 1, 2, 4, 5, 6, 7, and others, broadening our scope of practice and experience.

3.5. Fundamental principles of nutrition

Dhaka Sishu Hospital (DSH) provides comprehensive definitions of malnutrition, outlines the different types of nutrition, and sets forth the criteria for conducting nutritional assessments. These guidelines are presented here for a thorough understanding.

3.6. Standard nutritional classifications and thresholds

Standard anthropometric assessments for children include measuring their height, weight, head circumference, and mid-upper arm circumference (MUAC). Additionally, the presence of bilateral pitting edema is often evaluated as a clinical indicator alongside these measurements. Various metrics are utilized in these assessments, such as head circumference for age, weight-for-height (WFH), weight-for-age (WFA), and height-for-age (HFA). A z-score, which measures how much a person's measurements deviate from the median values specified in the Child Growth Standards of the World Health Organization, is used to represent each of these indicators. A value of the z-score that deviates from the accepted "normal" range is indicative of a nutritional issue. Furthermore, MUAC measurements and birth weight are analyzed against age-specific cutoffs to assess nutritional status.

Table 1: Nutritional Status Types

CONDITION	DESCRIPTION	MEASURE or INDEX	MODERATE	SEVERE
Chronic malnutrition is indicated by stunting, which also heightens the likelihood of death.	Low length /height in relation to age	Height for age	<-2 to $\geq$ -3 z-score	< -3 z-score
Rapid weight loss, inadequate weight gain, or the presence of bilateral pitting edema (fluid accumulation in both feet) are signs of acute malnutrition.	low weight in comparison to height and/or length	For MUAC (6–59) months, WFH* or BMI-for-age or edema	<-2 to $\geq$ -3 z-score	< -3 z-score
Being underweight may be a symptom of either stunting, acute malnutrition, or a combination of both.	low weight compared to age	Weight for age	<-2 to $\geq$ -3 z-score	< -3 z-score
Obesity is characterized by an excessive accumulation of body fat.	Excessive weight in relation to height or length	BMI for age or weight for height	> +2 to $\leq$ +3 z-score (overweight)	> +3 z-score (obese)
Low birth weight is a risk factor for increased infant mortality, stunting, and impaired brain development.	Low weight measured within 24 hours of birth	Weight	< 2,500 g to $\geq$ 1,500 g (low)	< 1,500 g (very low)

Source: National Guidelines for the Facility-based Management of Children with Severe Acute Malnutrition in Bangladesh.

CHAPTER 4

FUNDAMENTAL OF ‘SAM’

4.1. Basis and Background

We learned about the principles of severe acute malnutrition and how to recognize it on the first day. Then delved into the factors influencing the condition of children in Bangladesh. Discussions encompassed an understanding of severe acute malnutrition and the preparation for its management both in hospital settings and within the community. In collaboration with all health authorities across Bangladesh, the National Nutrition Program has created a comprehensive strategy for addressing child malnutrition in both clinical and community environments. This study involves a detailed examination of each of these topics.

4.2. Addressing Severe Acute Malnutrition in Bangladesh

Severe acute malnutrition (SAM) is a leading cause of death among children. It affects approximately 20 million young children, primarily in Africa and Southeast Asia. Globally, malnutrition contributes to the deaths of 8 million children under five each year.

The risk of death is nine times higher in malnourished children compared to their well-nourished counterparts. In Bangladesh, the prevalence of malnutrition and underweight among children aged five and under decreased from 51% in 2004 to 36% and 41% in 2007, as per the Bangladesh Demographic and Health Survey (BDHS) 2014. However, the rate of reduction has been slow, declining from 17% to 14.3% over a decade, indicating a need for improved efforts. According to BDHS 2014, around 3.1% of children under five, which is about 450,000 children, suffer from SAM based on their weight-for-height z-score (WHZ) of -3. The actual number of SAM cases could be significantly higher, as there is a lack of public data in children under five, the presence of bilateral edema and the mid-upper arm circumference (MUAC) are used to determine the prevalence of SAM.

Effective treatment of children with SAM is achievable using World Health Organization (WHO) guidelines, which have been proven to be equitable and feasible, even in resource-limited rural healthcare settings. Adherence to WHO protocols has led to significant reductions in mortality rates. These WHO guidelines address mental health and involve 10 steps across two phases, acknowledging the various physiological changes occurring in severely malnourished individuals.

4.3. Integrative Approach to Severe Acute Malnutrition Management

In Bangladesh, the care for children suffering from severe acute malnutrition (SAM) has traditionally been provided in institutional settings with supportive care. However, this treatment reaches only a limited number of cases due to various factors. Present case seeking in the community is frequently scarce or nonexistent, the time and cost of hospital care is a hardship for many families, and health facilities struggle to effectively manage heavy caseloads. Hospitalization becomes imperative for children with SAM when they present with life-threatening medical complications. In situations without complications, the treatment's technical elements are relatively straightforward. There is a consensus that SAM cases without additional complications can be effectively managed in community settings, eliminating the need for hospital care. Consequently, a more inclusive approach is advocated to enhance coverage and access to treatment for a greater number of children with severe acute malnutrition. This approach typically involves a comprehensive plan that addresses the various aspects of community-based management.

4.4. Classification and Understanding of Acute Malnutrition

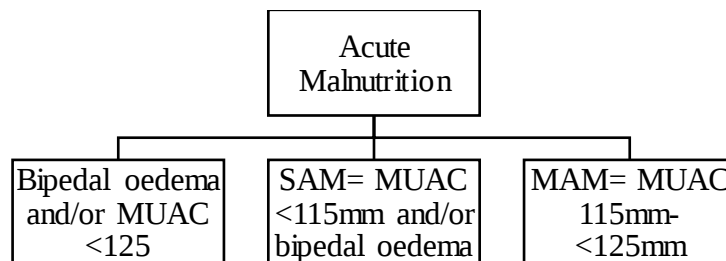


Figure 1: Classification of Acute malnutrition

Source: National Guidelines for the Facility-based Management of Children with Severe Acute Malnutrition in Bangladesh.

4.5. Strategy for Severe Acute Malnutrition Management

The management of severe acute malnutrition (SAM) involves two distinct approaches, tailored according to the complexity of each child's condition. These approaches are differentiated based on whether the child's case of SAM is complicated or uncomplicated. The specific steps for each approach are outlined in the following diagram.

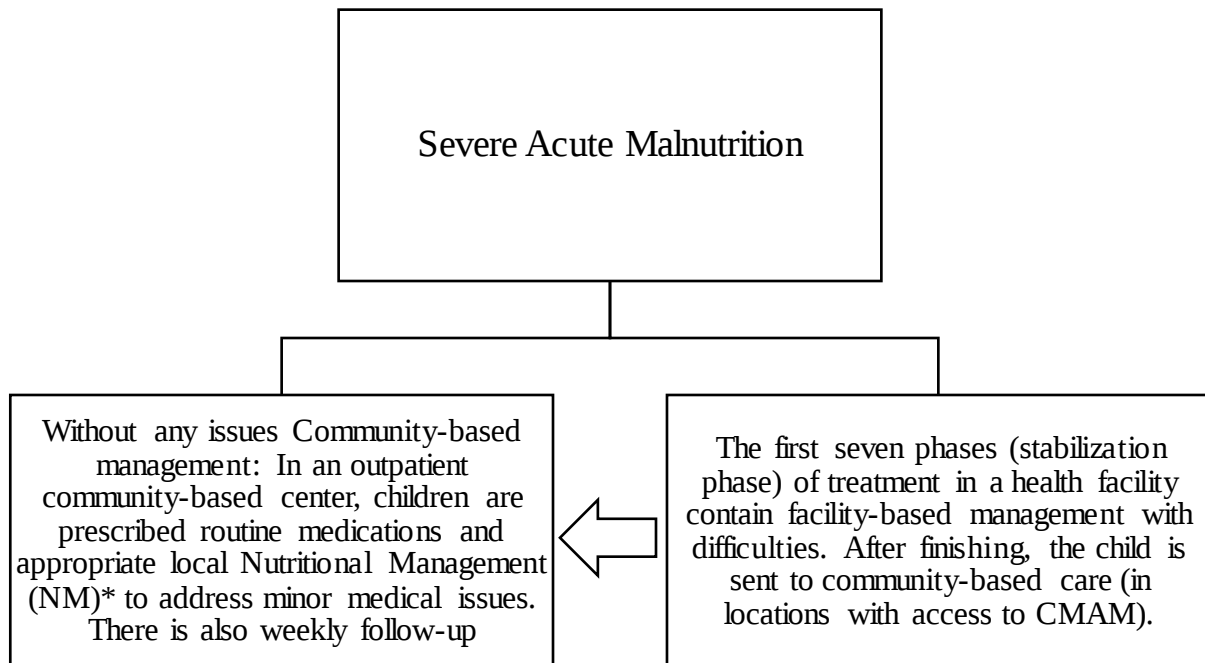


Figure 2: Severe Acute Malnutrition Management

Source: National Guidelines for the Facility-based Management of Children with Severe Acute Malnutrition in Bangladesh.

4.6. Advantages of a Hybrid Facility-Community Approach

Active community-based screening for severe acute malnutrition (SAM) involves using rapid assessment tools such as the mid-upper arm circumference (MUAC) method. This proactive approach in the community is crucial for the early identification of children with SAM, ideally before they develop any severe health complications. With consistent early detection, it is estimated that only about 10 to 15 percent of the identified cases would require inpatient hospital treatment. This selective use of hospital resources allows healthcare providers should focus their attention on giving children with SAM who exhibit other health issues appropriate care. Community-based management of child care, when easily accessible, significantly reduces the risk of hospital-acquired infections. Additionally, it offers substantial benefits to the families of the affected children. These benefits include reduced time spent away from home and peers, and lower opportunity costs for caregivers, making the treatment process more manageable and less disruptive to family life.

CHAPTER 5

ASSESSMENT AND CRITERIA OF SAM

5.1. Assessing Admission Criteria for Severe Acute Malnutrition

On the second day, the focus was on learning how to identify severe acute malnutrition (SAM) and determining the criteria for admission. We were taught the definition of severe acute malnutrition and the specific requirements that a patient must meet to be admitted for treatment. This knowledge is crucial for the effective diagnosis and subsequent management of SAM cases.

5.2. Examination of Extreme Acute Malnutrition

The assessment of individuals with severe acute malnutrition (SAM) has led to the following conclusions:

It is evident that these children are suffering considerably. A child is diagnosed with severe acute malnutrition if they exhibit one or more of the following indicators:

- Mid-Upper Arm Circumference (MUAC) less than 11.5 cm.
- Weight-for-height z-score lower than -3 standard deviations (SD) or weight-for-length z-score lower than -3 SD.
- Presence of Bipedal Edema.

Furthermore, the categorization of children as young as 6 months old as SAM cases raises additional considerations. A child under 6 months of age should be diagnosed with SAM if they fulfill one or more of the subsequent criteria:

- Z-score for weight-for-length less than -3 SD.
- Presence of Bipedal Edema.
- Observable severe wasting.

5.3. Classification System for Oedema in Children

Table 2: Oedema Grade

Severity of Oedema	Description
Grade 1	Slight: Just the ankles or feet
Grade 2	Intermediate: Includes feet, lower legs, hands, or forearms
Grade 3	Intense: Extensive edema covering feet, legs, hands, arms, and face

5.4. Criteria for Admission for Inpatient and Outpatient Service

If a child exhibits symptoms of any of the following conditions, hospitalization or regular medical care will be necessary:

Table 3: Admission Criteria

Sign	Criteria for inpatient treatment
Oedema	*Grade++ and grade +++
Oedema with wasting	Any grade of Oedema with MUAC<115mm or WLZ or WHZ<-3)
Appetite/anorexia	Poor appetite or unable to eat
Vomiting	Persistent vomiting (>3 per hour)
Temperature	Fever (>39°C or 102.2°F axillary) or hypothermia (<35°C or 95°F axillary)
Respiratory rate	Rapid breathing according to IMCI guidelines for age ≥60/min for children <2 months ≥50/ min for children 2-12 months and ≥40/ min for children 15-59 months
Anemia	Severely pale (severe palmer pallor) with or without difficulty breathing
Infection	Extensive infection requiring parenteral treatment
Alertness	Very weak, apathetic, unconscious, fitting/convulsions

Hydration status and dehydrating diarrhea	Dehydration based primarily on a recent history of diarrhoea, vomiting, fever or sweating, not passing urine for last 12 hours and on recent appearance of clinical signs of dehydration as reported by the caregiver.
Other criteria	Infant <6 months with severe acute malnutrition Caregiver requests inpatient care

CHAPTER 6

PRINCIPAL AND STAGES OF SAM MANAGEMENT

6.1. Core Principles of SAM Management

Despite fulfilling all the criteria for severe acute malnutrition (SAM), a child may still require admission due to the severity and critical nature of their condition. Such a child is profoundly and severely malnourished, necessitating specialized care. "SAM management" encompasses a series of ten steps as outlined in the national guidelines. These steps are subject to regular review and modification.

In the initial phase of treatment, the chef and doctor collaboratively address critical issues such as the child's low blood sugar, hypothermia, and dehydration, particularly focusing on stabilizing these conditions during the first two days. In the subsequent sections, we will enumerate and briefly explain each of these steps, along with their respective time frames.

There are ten essential steps for management:

- Step-1: Treat or avoid hypoglycemia in step one.
- Step- 2: Treat or avoid hypothermia.
- Step- 3: Treat or avoid dehydration thirdly
- Step- 4: Correcting an electrolyte imbalance.
- Step- 5: Treatment or preventing infection
- Step- 6: Remedying deficits in micronutrients.
- Step- 7: Carefully begin feeding, which includes nursing
- Step- 8: Achieve catch-up growth.
- Step- 9: Providing emotional support and sensory stimulation.
- Step-10: Setting up discharge plans and follow-up care following recovery.

In regions where community-based care systems are established, children with severe acute malnutrition (SAM) exhibiting symptoms can be treated in a hospital setting, but only through the initial seven stages of the SAM management protocol. The completion of these stages should ideally take between 4 to 7 days. After this period, the child is typically transitioned to continue receiving care for SAM within the community-based framework.

6.2. Two-Phase Approach for Completing Steps

- a. Stabilization Phase:** This initial stage involves correcting biochemical imbalances, addressing and treating any life-threatening conditions, remedying specific deficiencies, and initiating feeding. The primary focus is on stabilizing the child's critical health status.
- b. Rehabilitation Phase:** This phase marks the beginning of an intensive program aimed at helping the child regain lost weight. There is an increased focus on both emotional and physical stimulation during this stage. Additionally, efforts are made to either reinstitute or reinforce breastfeeding, which is a crucial component of this recovery phase.

6.3. Management Timeline for Children with Severe Acute Malnutrition

The accompanying diagram illustrates the timeline for the care of a child suffering from severe acute malnutrition. This timeline provides a visual representation of the stages and duration of treatment.

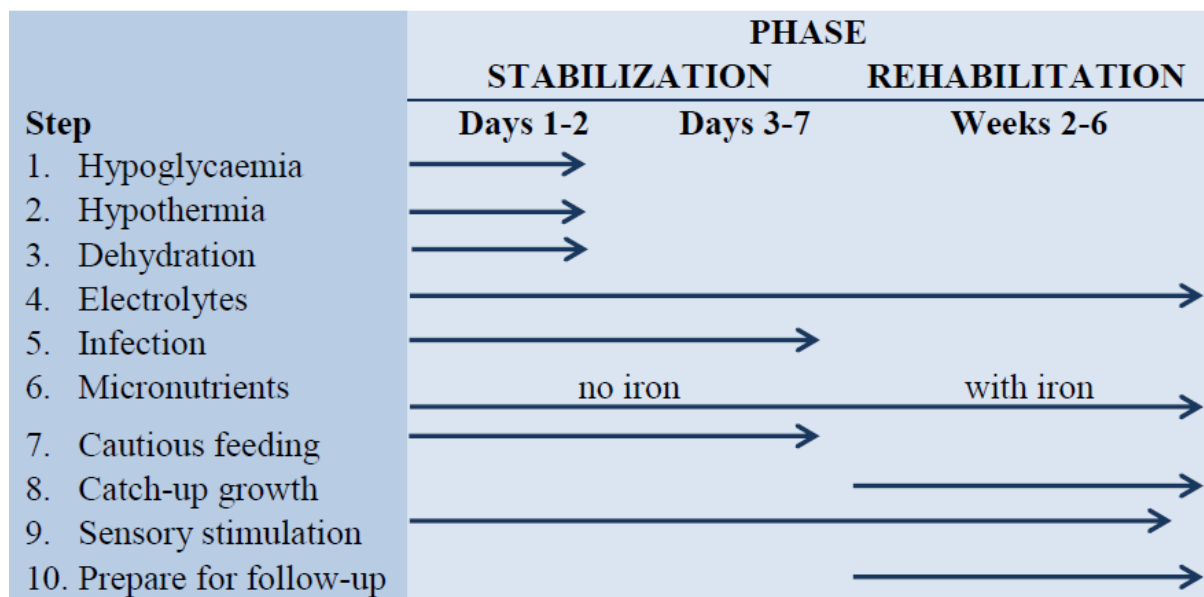


Figure 3: Management Timeline for Children with Severe Acute Malnutrition

Source: National Guidelines for the Facility-based Management of Children with Severe Acute Malnutrition in Bangladesh

A two-to-three-day intervention transitional phase of treatment involves switching from a low-calorie, low-protein (F-75) diet to a high-calorie, high-protein diet (F-100).

6.4. Step 1: Prevention or cure of hypoglycemia

Diagnosis of Hypoglycemia

Concurrent hypoglycemia and hypothermia often occur during illness, typically as a result of an underlying infection. Hypoglycemia can also develop in a child who has experienced prolonged fasting, not having eaten for approximately four to six hours. The presence of hypothermia (Lower than 35 degrees Celsius, or 95 degrees Fahrenheit, in the axilla) or symptoms such as drowsiness, flaccidity, limpness, or loss of consciousness should prompt consideration of hypoglycemia.

To accurately diagnose hypoglycemia, blood glucose levels need to be promptly and precisely measured, which can be done using tools like dextrostix. If this is not available, a blood sample must be taken for glucose level testing. Hypoglycemia is defined when blood sugar levels are at or below 3 mmol/L (54 mg/dL).

Treatment Protocol for an Awake Baby:

- a. **Administering Glucose or Sucrose:** If the baby is conscious, administer 50 ml of a 10% glucose or sucrose solution either orally or via a nasogastric (NG) tube. This solution consists of 5 grams (50 ml (about 3.5 tablespoons) of sugar dissolved in one adjusted teaspoon, of water.
- b. **Initial Feeding with F-75:** Begin feeding with the starter diet, F-75, but limit the quantity to one-fourth of the recommended meal size for every two-hour feeding interval.
- c. **Maintaining Warmth:** Ensure that the child is kept warm throughout the treatment process.
- d. **Medication Administration:** Proceed with the prescribed medication regimen as the next step in treatment.
- e. **Regular Feeding Schedule:** Implement a feeding schedule of every two hours, around the clock, to ensure consistent nourishment.

Treatment Protocol for an Unconscious or Convulsing Child:

- a. **Glucose Administration:** If the kid is unresponsive or experiencing seizures, administer 10% glucose intravenously at a dosage of 5 ml per kilogram of body weight. Follow this with 50 ml of 10% glucose or sugar solution through a nasogastric (NG) tube. Subsequently, initiate feeding with starter F-75 as previously mentioned.
- b. **Seizure Management:** In cases where seizures persist after the glucose infusion, administer rectal diazepam at a dosage of 0.5 mg per kilogram of the child's body weight.
- c. **Maintaining Warmth:** It is crucial to ensure that the child is kept warm throughout the treatment process.

- d. Medication Administration:** Proceed with administering any other prescribed medications as part of the treatment plan.

Ongoing Monitoring and Actions Post-Treatment:

- a. Blood Sugar Monitoring:** Perform a follow-up dextrostix test for blood sugar two hours after the initial treatment. Usually, most children show improvement within 30 minutes of starting treatment. If the blood glucose level remains below 3 mmol/L, Give a 50 ml infusion of 10 percent sucrose or glucose solution extra. For the following two hours, keep feeding the child every 30 minutes, giving them one-fourth of the suggested two-hour meal size.
- b. Temperature Check:** Monitor the child's temperature in the axilla. Repeat the dextrostix test if the temperature falls to 36.0 °C (96.8 °F).
- c. Observing Consciousness Level:** If there is no change in the degree of awareness, it is necessary to repeat the hypoglycemic treatment.
- d. Assessing Other Causes and Referral:** Consider alternative explanations for the child's condition. If there is no improvement, consider referring the child to a higher-level medical facility for further evaluation and treatment.

6.5. Step 2: Hypothermia treatment and prevention

Diagnosis:

If a child's axillary temperature is at or below 35°C (95°F), the following measures should be implemented to address, monitor, and prevent further occurrences of hypothermia.

Treatment:

- To rewarm the child, undertake the following steps:
- Dress the child appropriately, including head coverings.
- Use a warm blanket for additional covering.
- Increase ambient temperature using safe heat sources.
- Alternatively, place the child on the mother's bare chest, covering both with a blanket (this method is known as skin-to-skin contact or Kangaroo Mother Care (KMC)).

Monitoring:

- Ensure the child is covered at all times, with special attention during the night.
- Maintain a comfortable environment to ensure warmth.

- Regularly monitor the axillary temperature every two hours during the rewarming process until it reaches a stable 37°C (98.6°F).
- Check the child's blood glucose level when hypothermia is detected to rule out hypoglycemia.

Prevention of Hypothermia in Children: Key Strategies

- **Maintaining Warmth:** Ensure the child is kept warm and protected from exposure to cold environments.
- **Dryness and Cleanliness:** Avoid unnecessary bathing. Keep the child dry at all times by promptly changing wet diapers, clothes, and bedding.
- **Limiting Exposure:** Minimize exposure during activities like washing or extended clinical examinations. Facilitate the child's feeding in the warmth of the mother's or caregiver's embrace. Initiate feeding immediately and maintain a frequency of every two hours.
- **Vigilant Care:** Provide consistent and attentive care during the day and particularly throughout the night, with special emphasis on the critical first 24-48 hours during the stabilization phase.

6.6. Step 3: Prevention and Treatment Deficiency in fluids

Diagnosis of Dehydration in Severely Malnourished Children:

Clinical indications of dehydration, such as extremely taut skin, recessed eyes, and a parched mouth, can be observed in children with severe acute malnutrition (SAM). However, these symptoms might also be indicative of septic shock. This overlap makes it challenging to diagnose SAM based solely on these signs. Other symptoms, like cold extremities and reduced urine output, may vary in their presentation. In marasmus (severely underweight) children, dehydration might appear more severe, whereas in children with kwashiorkor (characterized by edema), it may be underappreciated. It's important to recognize that loose, watery stools are a common occurrence in these children.

Treatment for Dehydration in SAM:

Both the modified WHO-ORS solution (75 mmol of sodium per liter) and the normal Oral Rehydration Salts (ORS) solution (90 mmol of sodium per liter) designed for children with severe acute malnutrition contain high levels of sodium but are low in potassium. For rehydration purposes, it is advisable to use a specialized rehydration formula specifically formulated for malnourished individuals.

Table 4: Hydration Mix for Nutritional Recovery (Resomal)

For those with SAM, the recently updated WHO-ORS (75 mmol sodium/L) includes less sodium & more potassium. Give a specific rehydration solution (Resomal) if malnutrition is present.

Ingredient	Measure
Cooled, Boiled Water	850 ml
Updated WHO Oral Rehydration Solution (75 mmol sodium/L)	One 500 ml packet
Cane Sugar	20 grams
Solution of Electrolytes and Minerals	16.5 ml (optional)

Source: National Guidelines for the Facility-based Management of Children with Severe Acute Malnutrition in Bangladesh

Monitoring During Treatment:

For the initial two hours, observations should be made every 30 minutes, followed by hourly checks for the next 4 to 10 hours. Key parameters to monitor include:

- Heartbeat Frequency: Monitor the rate and rhythm of the heart.
- Respiratory Rate: Observe the rate of breathing.
- Urine Output Regularity: Track how often the child urinates.
- Stool and Vomit Count: Record the number of times the child passes stools or vomits per day.

During treatment, a successful rehydration process is indicated by a decrease in rapid breathing and heart rate, and the initiation of urination. Other signs of effective rehydration include the return of tears, moistening of the mouth and eyes, less sunken fontanelle, improved skin turgor, and increased urine output. However, it's important to note that many children with severe acute malnutrition may not exhibit these signs even after receiving appropriate fluids. Persistently rapid breathing and heart rate during rehydration may indicate a more serious condition, such as overhydration.

Prevention of Severe Dehydration:

To prevent severe dehydration in children with persistent watery diarrhea, the following steps should be undertaken:

- Continued Feeding with F-75: Maintain the feeding regimen.
- Use of Resomal: Administer Resomal to compensate for fluid loss due to diarrhea (provide 5-10 ml/kg of body weight after each watery stool). Note that frequent, small, unformed stools common in malnourished children should not be mistaken for severe diarrhea, and these children do not require additional fluids.
- Encourage Breastfeeding: If the child is still breastfeeding, increase the frequency of breastfeeding sessions.

6.7. Step 4: Correcting Electrolyte Imbalance:

In cases of electrolyte imbalance, the following measures should be taken:

- Potassium Supplementation: Add an extra 4 mmol/kg/day of potassium for one week.
- Magnesium Supplementation: Include an additional 0.1 ml/kg/day of 50% magnesium sulfate for one week.
- Use of Low-Sodium Rehydration Solution: Utilize a low-sodium rehydration solution such as Resomal during the rehydration process.
- Avoid Salt in Food Preparation: Do not add salt when preparing food.
- Avoid Diuretics for Edema: Do not use diuretics to treat edema in these cases.

6.8. Step 5: Infection treatment and prevention

Diagnosis of Infections in Severe Acute Malnutrition (SAM):

In cases of severe acute malnutrition, typical signs of illness such as fever may not be present, and infections can often remain concealed, making it difficult to detect the presence of illness. As a result, when a child with SAM is admitted to the hospital, it is standard practice to administer broad-spectrum antimicrobials to effectively target a wide range of potential infections.

Treatment Protocol for Infections in SAM:

- Bacterial Infections: These are the most common type of infections in children with SAM.

- **Often Asymptomatic:** There may not always be any overt indications of an infection. It is recommended to routinely administer broad-spectrum antibiotics to these patients as a precautionary measure.
- **Measles Vaccination:** For children over 6 months old who have not yet received a measles vaccine, vaccination should be administered as part of their treatment plan. This is crucial since measles can be particularly severe in malnourished children.

6.9. Step 6: Correct Micronutrient Deficiencies

Nutritional Deficiencies in Severe Acute Malnutrition (SAM):

Individuals with severe acute malnutrition (SAM) typically experience significant deficiencies in vitamins and minerals. While it is common for these individuals to exhibit signs of weakness, initial administration of iron is usually deferred. Iron supplementation should commence only after the acute phase of the illness has passed, the child's appetite returns to normal, and weight gain begins. Early iron supplementation during the acute phase of illness can potentially exacerbate the condition.

Treatment Protocol for Nutritional Deficiencies in SAM:

- **Vitamin A Supplementation:** Administer an oral dose of Vitamin A on the first day, unless there's proof that a dosage was administered recently. The dosage varies by age: 200,000 IU for children over 12 months, 100,000 IU for children aged 6-12 months, and 50,000 IU for children aged 0-5 months.
- **Daily Supplementation for at Least Two Weeks:** The following supplements should be administered daily for a minimum duration of two weeks:
 - Multivitamin Supplement: Ensure availability and administration.
 - Vitamin B12: Administer 1 milligram per day.
 - Copper: Provide 0.3 mg/kg body weight.
 - Zinc: Administer 2 mg/kg body weight.

Table 5: Schedule for Administering Micronutrients

Nutrients	Within Electrolyte/Mineral Mix	If Using Individual Supplements
Vitamin A on Day 1	Yes	Yes
Following for Minimum Two Weeks:		
Multivitamin Supplement	No	Yes
Folic Acid 1 mg/day (5mg on Day 1)	Yes	Yes
Zinc 2mg/kg/day	No	Yes
Copper 0.3 mg/kg/day	No	Yes
Elemental Iron 3mg/kg/day (initiate upon weight gain, continue for approximately 3 months)	Yes	Yes
Potassium* 4mmol/kg/day	No	Yes
50% Magnesium Sulphate* 0.1ml/kg/day intramuscularly for 7 days	No	Yes

Source: National Guidelines for the Facility-based Management of Bangladeshi Children Suffering from Severe Acute Malnutrition

6.10. Step 7: Initiating Careful Feeding for Malnourished Children:

Due to the developing state of a malnourished child's body and their inability to tolerate large feedings, it is crucial to begin feeding cautiously. Feeding should start as soon as it is safe following admission. The nutritional aim is to provide sufficient protein and energy to maintain normal bodily functions. These guidelines are specifically for children aged 6 to 59 months. Different considerations apply to infants younger than six months.

Key Components of Feeding During the Stabilization Phase:

- **Meal Frequency and Composition:** Provide small, frequent meals that are low in lactose and osmolality.
- **Feeding Methods:** Strongly emphasize oral or nasogastric (NG) feeding methods, avoiding injectable formulations.
- **Caloric Needs:** Aim for a daily intake of 100 kcal/kg.
- **Protein Intake:** Administer protein at a rate of 1 to 1.5 grams per kilogram of body weight per day.
- **Fluid Intake:** Limit fluid intake through meals to no more than 130 mL/kg per day, or 100 mL/kg per day in cases of severe (+++) edema, which may involve swelling of the legs, hands, and face.

The above goals should be met as efficiently as possible using the starter formula and eating plans discussed in more detail below. A lot of kids benefit from milk-based formulas like starter formula F-75, which offers 75 kcal and 0.93 g of protein per 100 ml. For extremely weak children, alternative feeding methods like spoons, drips, or syringes can be used. Below is a proposed feeding schedule that gradually decreases the frequency of feedings while increasing the quantity of each meal.

Table 6: Suggested Plan for Incrementally Boosting Feed Volume and Lowering Feeding Intervals

Days	Interval Between Feeds	Amount per Feeding (ml/kg)	Daily Total (ml/kg)
1-2	Every 2 hours	11 ml	130 ml
3-5	Every 3 hours	16 ml	130 ml
6+	Every 4 hours	22 ml	130 ml

Source: National Guidelines for the Facility-based Management of Children with Severe Acute Malnutrition in Bangladesh

To adjust the frequency and volume of F-75 feeds for a child with severe acute malnutrition, the following criteria should be met:

- **Continued Two-Hourly Feeds:** If the child experiences more than five episodes of loose stools per day, vomits, or has a poor appetite, continue feeding them F-75 every two hours.

- **Transition to Three-Hourly Feeds:** Change the feeding schedule to every three hours when the child shows improvement, characterized by minimal or no vomiting, fewer than five episodes of loose stools per day, and consumption of most of their meals.
- **Switching to Four-Hourly Feeds:** After successfully feeding the child every three hours for a day, and observing further improvements such as no vomiting, reduced diarrhea, and good meal consumption, transition to feeding them every four hours.

6.11. Step 8: Attain growth to catch up

During the recovery phase, encouraging a robust appetite is key to achieving high caloric intake and rapid weight gain of >10 g/kg/day. A patient is ready to progress to the recovery phase when their edema has significantly reduced and their appetite has returned, typically about one week after admission. To mitigate the risk of heart failure, it's important to gradually decrease sugar intake if the child has been consuming high amounts in a short period. These guidelines are for children aged 6 to 59 months, with separate considerations for infants younger than six months.

For children with diabetes, the F-100 formula, which is based on milk and has 2.9 grams of protein and 100 calories per 100 milliliters, is appropriate. Towards the final stages of recovery, introducing family foods like Khichuri and Halwa is beneficial. It's crucial to ensure that these foods match the caloric content of F-100. Parents and caregivers play a vital role in this process, providing encouragement and ensuring the child spends enough time to complete each meal. Children should be taught to eat properly while seated calmly on the lap of their mother or caregiver.

To transition from the starter formula to the catch-up formula, follow these steps:

- For 48 hours during the changeover phase, replace the starter formula F-75 with an equal amount of the catch-up formula F-100 every four hours.
- Then, gradually increase the volume of each feed by 10 ml until a portion of the feed remains uneaten.
- Aim for a feeding volume of about 30 ml/kg/feed (up to 200 ml/kg/day), at which point some of the meal may be left over.

The following formula can be used to determine weight increase in kilograms per day:

$$\text{Weight Increase (kg/kg/day)} = \frac{(W2-W1)}{W1}$$

- Where W1 is the starting weight, expressed in kilograms.
- W2 is the weight in kilos on the day of calculation.

Alternatively, if weight gain is tracked daily, you can use the formula for average daily weight gain, which is expressed in grams per kilogram per day (g/kg/day). This calculation would be:

$$\text{Average Daily Weight Gain (g/kg/day)} = \left(\frac{W2 - W1}{\text{Number of days}} \right) \times \frac{1000}{W1}$$

Where:

- W1 the original or lowest weight in kilos.
- W2 the weight, expressed in kilograms, on the day of calculation.
- Number of Days is the total number of days over which the weight gain is being measured.

It's important to note that while severe malnutrition can negatively impact a child's mental and behavioral development, these effects can often be reversed with adequate treatment. This includes not only nutritional therapy but also sensory stimulation and emotional support to address developmental needs.

6.12. Step 9: Offering Emotional Support and Sensory Stimulation

To provide holistic care for children, especially those recovering from illness or malnutrition, it's essential to include the following elements in their daily care routine:

- **Warm and Patient Interaction:** Engaging with the child in a kind and patient manner is crucial. This includes actions such as smiling, laughing, gentle patting, and touching. These simple acts of warmth and affection can significantly contribute to the child's emotional well-being.
- **Stimulating Environment:** Ensure the environment is stimulating and enjoyable for the child. A lively and engaging setting can have a positive impact on their overall mood and recovery process.
- **Structured Play Therapy:** Allocate 15–30 minutes each day for organized play therapy. This should involve the use of toys made from inexpensive, locally available materials. Play therapy is not only enjoyable but also aids in the child's cognitive and emotional development.
- **Physical Activity:** As soon as the child is medically stable and able enough, encourage them to engage in physical activities. This can include simple movements or light exercises suitable for their age and health condition. Physical activity is important for both physical rehabilitation and mental health.

6.13. Step 10: Getting ready for discharge and post-recovery follow-up

When a child's weight-for-length z-score (WLZ) or weight-for-height z-score (WHZ) exceeds -2, they can be considered sufficiently recovered for discharge from the emergency clinic. However, ensuring a complete recovery necessitates thorough follow-up care. It's important to implement the following steps during the restoration phase:

- **Educational Guidance for Guardians:** Teach the guardians how to prevent malnutrition from recurring. This includes providing them with instructions and recipes for nutritious meals, such as halwa and khichuri cooking, as detailed in addendum 8. Educating the guardians in this way is crucial for maintaining the child's health post-discharge.
- **Developing a Follow-Up Plan:** Prior to discharge, establish a clear plan with the guardians for follow-up consultations. This plan should outline the schedule and objectives for these talks, ensuring that any signs of malnutrition recurrence are promptly addressed. The follow-up strategy is a critical component of the child's long-term health and well-being, helping to monitor their progress and provide necessary interventions when needed.

Criteria for discharging a child from inpatient care in areas lacking community-based outpatient care, focusing on both the child's health status and the preparedness of the mother (or primary caregiver):

Table 7: Criteria for discharge from inpatient care in areas where there is no community-based outpatient care

Criteria for Discharge	Details
For the Child	
Weight-for-Height Z-Score (WHZ)	WHZ $\geq$ -2
Edema	Resolution of edema
Infections and Medical Complications	Absence of infections and medical complications
Immunization Status	Immunizations completed or appropriately planned

Criteria for Discharge	Details
For the mother/Caregiver	
Nutritional Knowledge	Ability to prepare a homemade balanced diet and feed the child appropriately
Home Treatment for Diarrhea	Understanding about how to manage diarrhea at home
Recognition of Danger Signs	Ability to identify warning indicators that call for medical attention.
Follow-up Advice	Understanding of an agreement to adhere to advice for follow-up care

Source: National Guidelines for the Facility-based Management of Bangladeshi Children Suffering from Severe Acute Malnutrition

Follow-Up Care Post-Discharge:

Post-discharge follow-up care is crucial for ensuring the continued recovery and health of the child. The follow-up schedule and programs are as follows:

- a. **Initial Follow-Up Visit:** Schedule a follow-up visits at a health facility or a nearby public or NGO facility one week after discharge. Suitable facilities include Community Clinics (CC), Union Health and Family Welfare Centers (UH&FWC), Integrated Management of Childhood Illness (IMCI) Nutrition corners, Expanded Programmed on Immunization (EPI) centers, etc.
- b. **Subsequent Follow-Up Visits:** Conduct additional follow-up visits at 1 week, 2 weeks, 1 month, and 3 months post-discharge. After the initial period, continue these visits every 3 months until the child's weight-for-height z-score (WHZ) becomes greater than -1.
- c. **Enrollment in CMAM Program:** Enroll the child in the Community-Based Management of Acute Malnutrition (CMAM) program. This program provides comprehensive care, including nutritional support and monitoring.
- d. **Monthly Growth Monitoring and Promotion (GMP) Sessions:** Attend monthly GMP sessions at health centers or NGO facilities. These sessions, which should be attended up to the child's fifth year, are crucial for monitoring the child's growth and development.
- e. **Enrollment in Safety Net Programs:** Enroll the child in safety net programs that offer additional support and resources to ensure their well-being and nutritional status.

These follow-up steps are designed to provide continuous care and support to the child, ensuring that their recovery is sustained and they are protected against the recurrence of malnutrition.

CHAPTER 7

TREATMENT FOR ACCESSORY CONDITIONS

7.1. Insufficiency of Vitamin A in Children

Children with a deficiency in vitamin A often exhibit symptoms such as photophobia (sensitivity to light) and a tendency to keep their eyes closed. To prevent discomfort and potential damage, it is crucial to conduct a thorough and gentle examination of the eyes. Each child's eyes should be examined with care and compassion. To address vitamin A deficiency, administer vitamin A supplements on days 1, 2, and 14. This regimen is important for ensuring adequate vitamin A levels in the child and for mitigating any associated risks or symptoms.

Table 8: Vitamin A Dosages

Age Category	Vitamin A Dosage
Infants 0-5 months	50,000 International Units (IU)
Infants 6-12 months	100,000 International Units (IU)
Children older than 12 months	200,000 International Units (IU)

Source: National Guidelines for the Facility-based Management of Children with Severe Acute Malnutrition in Bangladesh

7.2. Signs of Dermatitis:

Dermatitis, a general term for skin disorders, can manifest through various symptoms. Key signs to look out for include:

- Hypo or Hyperpigmentation: Changes in skin color, either lighter (hypopigmentation) or darker (hyperpigmentation) than the surrounding skin.
- Ulceration: Open sores or wounds on the skin, which can be a sign of severe dermatitis.
- Desquamation: Peeling or shedding of the outer layer of the skin.
- Exudative Lesions: Sores or areas on the skin that weep or ooze fluid, often accompanied by secondary infections, including those caused by Candida (a type of fungus).

These symptoms indicate various possible dermatological conditions and should be evaluated by a healthcare professional for accurate diagnosis and appropriate treatment.

7.3. Helminthiasis Treatment:

Treatment for helminth (worm) infections in children should generally be postponed until the nutritional recovery phase. During this phase, administer a single dose of an anthelmintic (anti-worm) medication as follows:

- Up to 23 months old: 200 mg of albendazole.
- For children older than 24 months, one dose of albendazole should be 400 mg.
- Children older than 24 months (different dosage): 100 mg twice a day of albendazole.
- Pyrantel Pamoate, 10 mg/kg, for children of any age

7.4. Management of Osmotic Diarrhea:

In cases where children with diarrhea show a significant worsening of symptoms upon consuming F-75 made with milk powder, which has an osmolality that is marginally greater, osmotic diarrhea may be suspected. To manage this:

- **Use a Low Osmolar Cereal-Based F-75:** Switch to a cereal-based version of F-75 formula with lower osmolality.
- **Gradual Introduction of F-100:** After stabilization with the F-75 based on low osmolar cereal, gradually introduce F-100 into the child's diet.

This approach helps to manage the osmotic load in the child's digestive system, easing symptoms of diarrhea and supporting better nutritional recovery.

7.5. Tuberculosis Management:

In cases where tuberculosis (TB) is strongly suspected, particularly in scenarios such as close contact with adult TB patients, poor growth despite adequate nutritional intake, persistent chronic cough lasting more than two weeks, or a cough not responding to conventional antibiotics, the following steps should be taken:

- **Mantoux Test:** Perform the Mantoux test, also known as the tuberculin skin test. This test involves injecting a small amount of tuberculin into the skin of the lower arm and observing the reaction after 48 to 72 hours. A positive test suggests TB infection but does not necessarily indicate active disease.
- **Chest X-Ray:** If feasible, conduct a chest X-ray for further evaluation. A chest X-ray can provide additional information and help in confirming a diagnosis of tuberculosis, particularly in cases where the Mantoux test is positive or where TB is strongly suspected based on clinical symptoms.

These diagnostic steps are crucial for the accurate identification and appropriate treatment of tuberculosis, especially in vulnerable pediatric populations.

CHAPTER 8

EVALUATING PATIENT OUTCOMES

8.1. Identifying Failure to Respond to Treatment

Failure to respond to treatment in the context of medical rehabilitation is typically indicated by a combination of high mortality rates and low weight gain. This can be further quantified and categorized using the Case Fatality Rate (CFR), a measure that helps to evaluate the effectiveness of treatment protocols.

Table-9: Categorizing different levels of CFR:

Category	Case Fatality Rate (CFR)
Unacceptable	>20%
Poor	11-20%
Moderate	5-10%
Good	<5%

This table provides a clear framework for assessing the outcomes of treatment regimens based on the CFR, with the aim of identifying areas needing improvement or adjustment in the treatment approach.

If mortality is higher than 5%, ascertain whether the majority of deaths take place:

In cases where the mortality rate exceeds 5%, it is crucial to analyze the timing of the deaths to identify potential causes and improve treatment protocols. Here are some considerations based on when most deaths take place:

- **Within 24 Hours:** Potential causes could include treatment delayed of hypoglycemia, hypothermia, septicemia, severe weakness. Incorrect rehydration solution or volume, or overuse of intravenous (IV) fluids, should also be considered.
- **Within 72 hours:** Look into whether an inappropriate formulation was utilized or if the feed volume was unnecessarily high. Ensure that potassium supplementation and appropriate antibiotics were administered.
- **During the Night:** Consider the possibility of hypothermia due to inadequate blankets or the absence of feedings at night.
- **While Transitioning to Formula F-100 Catch-Up:** The transition to F-100 might be too rapid, which can be problematic.
- **After 7 Days:** Hospital-acquired sepsis should be considered as a potential cause.

By closely examining these factors and timings, healthcare providers can identify and address specific issues in the treatment of severely malnourished children, aiming to reduce the mortality rate effectively.

8.2: Handling Minimal Weight Gain in the Rehab Stage:

To effectively monitor weight gain in hospitals, it's essential to ensure uniformity in the weighing process. This includes the daily calibration of weighing scales to maintain accuracy.

Table 10: The categorization of weight gain during the rehabilitation phase can be outlined as follows

Category	Weight Gain Rate
Poor	Less than 5 g/kg/day
Moderate	5-10 g/kg/day
Good	More than 10 g/kg/day

Source: National Guidelines for the Facility-based Management of Children with Severe Acute Malnutrition in Bangladesh

In instances where weight gain is less than 5g/kg/day, it's important to identify the root cause:

- **If Low Weight Gain is a General Trend:** If most cases exhibit poor weight gain, this might indicate a need for a significant management overhaul of the Nutrition Unit. Systematic issues in treatment protocols, nutritional formulations, or care practices may need to be addressed.
- **If Low Weight Gain is Observed in Specific Cases:** For individual cases showing inadequate weight gain, reassess the child as if it were a new admission. This includes a thorough screening for infections, which might be hindering weight gain. Potential infections to screen for include tuberculosis (TB), urinary tract infections, ear infections, and other common childhood illnesses.

This approach helps in pinpointing specific issues in the nutritional management and ensures that each child receives tailored care based on their unique health needs.

Possible Reasons for Poor Weight Gain:

- **Lack of Night Feeds:** Skipping night feeds can significantly contribute to poor weight gain.
- **Meeting Energy and Protein Targets:** Ensure that the child's diet meets the required targets for energy and protein intake.
- **Feeding Methods:** Frequent feeding and offering unlimited amounts are crucial.

- Care Quality: Evaluate the degree of motivation, gentleness, and affection exhibited by staff members or caregivers.
- Nutritional Content of Family Foods: Family foods provided should be modified to contain more than 100 kcal/100g.
- Multivitamin Adequacy: Ensure the composition and shelf life of multivitamins are adequate.
- Modification of Family Foods: If family foods are used, they must be suitably modified to provide more than 100 kcal/100g; if not, they should be re-modified accordingly.

CHAPTER 9

DISCHARGE

9.1. Criteria for Early Release Prior to Full Healing

A child may be considered for early discharge before full recovery when they reach at least 80% of the Weight-for-Height Z-score (WHZ) > -2 . Early discharge can be taken into consideration if there are efficient options for supervision. Home-based or clinic-based care may be appropriate under the following conditions:

Child's Criteria:

- Age over 12 months.
- Absence of edema.
- Completion of antibiotic treatment.
- Demonstrates good appetite and weight gain.
- Has received potassium, magnesium, mineral, and vitamin supplements for 2 weeks, or can continue supplementation at home.

Mother/Caregiver's Criteria:

- Not employed outside the home.
- Trained in providing appropriate feeding (in terms of type, amount, and frequency).
- Financial resources available to adequately feed the child.
- Resides close to the hospital for quick readmission in case of illness.
- Available for weekly home visits.
- Trained in structured play therapy.
- Motivated to adhere to medical advice.

Local Health Workers' Criteria:

- Trained to support home-based care.
- Skilled in clinical examination of the child at home to determine the need for clinic referral.
- Motivated to assist in the child's recovery process.

CHAPTER 10

EMERGENCY TREATMENT

10.1. Urgent Care for Extremely Severe Anemia and Shock

Distinguishing between serious dehydration and septic shock based solely on clinical signs can be challenging. Some common indications of septic shock include:

Diagnosing Shock:

- Shock can be challenging to distinguish from severe dehydration.
- Signs may include dehydration symptoms without watery diarrhea, hypothermia, or hypoglycemia.
- Children with dehydration usually respond to IV fluids, whereas those with septic shock without dehydration might not.

Criteria for Shock Diagnosis:

- Lethargic or unconscious state.
- Cold hands.
- Slow capillary refill (over 3 seconds).
- Weak or rapid pulse.

Initiating Treatment:

- Administer oxygen.
- Offer 10% sterile intravenous glucose.
- Provide 20 ml/kg of IV fluid over the course of an hour.
- Every thirty minutes, check the respiration and pulse rates.
- Ensure the child is warm.

If upgrades are noticed:

- Repeat the IV fluid (20 ml/kg) for one hour.
- For up to ten hours, switch to oral or NG rehydration using ReSoMal (10 ml/kg/h) in alternate with starting F-75.
- Feed the starter F-75 as usual.

If No Improvement:

- Maintain IV fluids while waiting for blood transfusion.
- Transfuse fresh whole blood at 10ml/kg over 3 hours when available.
- Treat any present sepsis with antibiotics.

CHAPTER 11

STANDARDS

Throughout this chapter, all essential tables for the care of severely malnourished children, in line with Bangladesh's national guidelines for facility-based treatment, are included. These tables provide an easy reference for:

- Calculating and determining the child growth standard.
- Preparing solution of mineral electrolyte.
- F-75 and F-100 formula recipes.
- Required quantities of F-75 for children with edema.
- Monitoring protocols for children recently discharged from severe acute malnutrition treatment.

This comprehensive compilation of tables allows for quick and efficient access to critical information, streamlining the care process for severely malnourished children.

11.1. The Child Growth Standards of 2006 by the World Health Organization

Table 11: 2006 WHO Standards for Child Growth:

Weight of Boys (kg)			Height			Weight of Girls (kg)		
−3SD	−2SD	−1SD	Median	(cm)	Median	−1SD	−2SD	−3SD
9.6	10.4	11.2	12.2	87	11.9	10.9	10.0	9.2
9.8	10.6	11.5	12.4	88	12.1	11.1	10.2	9.4
10.0	10.8	11.7	12.6	89	12.4	11.4	10.4	9.6
10.2	11.0	11.9	12.9	90	12.6	11.6	10.6	9.8
10.4	11.2	12.1	13.1	91	12.9	11.8	10.9	10.0
10.6	11.4	12.3	13.4	92	13.1	12.0	11.1	10.2
10.8	11.6	12.6	13.6	93	13.4	12.3	11.3	10.4
11.0	11.8	12.8	13.8	94	13.6	12.5	11.5	10.6
11.1	12.0	13.0	14.1	95	13.9	12.7	11.7	10.8
11.3	12.2	13.2	14.3	96	14.1	12.9	11.9	10.9
11.5	12.4	13.4	14.6	97	14.4	13.2	12.1	11.1

11.7	12.6	13.7	14.8	98	14.7	13.4	12.3	11.3
11.9	12.9	13.9	15.1	99	14.9	13.7	12.5	11.5
12.1	13.1	14.2	15.4	100	15.2	13.9	12.8	11.7
12.3	13.3	14.4	15.6	101	15.5	14.2	13.0	12.0
12.5	13.6	14.7	15.9	102	15.8	14.5	13.3	12.2
12.8	13.8	14.9	16.2	103	16.1	14.7	13.5	12.4
13.0	14.0	15.2	16.5	104	16.4	15.0	13.8	12.6
13.2	14.3	15.5	16.8	105	16.8	15.3	14.0	12.9
13.4	14.5	15.8	17.2	106	17.1	15.6	14.3	13.1
13.7	14.8	16.1	17.5	107	17.5	15.9	14.6	13.4
13.9	15.1	16.4	17.8	108	17.8	16.3	14.9	13.7
14.1	15.3	16.7	18.2	109	18.2	16.6	15.2	13.9
14.4	15.6	17.0	18.5	110	18.6	17.0	15.5	14.2
14.6	15.9	17.3	18.9	111	19.0	17.3	15.8	14.5
14.9	16.2	17.6	19.2	112	19.4	17.7	16.2	14.8
15.2	16.5	18.0	19.6	113	19.8	18.0	16.5	15.1
15.4	16.8	18.3	20.0	114	20.2	18.4	16.8	15.4
15.7	17.1	18.6	20.4	115	20.7	18.8	17.2	15.7
16.0	17.4	19.0	20.8	116	21.1	19.2	17.5	16.0
16.2	17.7	19.3	21.2	117	21.5	19.6	17.8	16.3
16.5	18.0	19.7	21.6	118	22.0	19.9	18.2	16.6
16.8	18.3	20.0	22.0	119	22.4	20.3	18.5	16.9
17.1	18.6	20.4	22.4	120	22.8	20.7	18.9	17.3

Source: National Guidelines for the Facility-based Management of Children with Severe Acute Malnutrition in Bangladesh

11.2. Electrolyte-Mineral Solution

To prepare the electrolyte-mineral solution, measure the specified quantities of each mineral and then dilute to a total volume of 2500 ml with water. This solution is then added to milk feed at a ratio of For every 1000 ml of milk feed, use 20 ml of electrolyte-mineral solution.

Table 12: Formula for Electrolyte and Mineral Mix

Element	Amount (grams)	Concentration in 20 ml
Potassium Chloride (KCl)	224	24 mmol
Tripotassium Citrate (C ₆ H ₅ K ₃ O ₇ ·H ₂ O)	81	2 mmol
Magnesium Chloride (MgCl ₂ ·6H ₂ O)	76	3 mmol
Zinc Acetate (Zn(CH ₃ COO) ₂ ·2H ₂ O)	8.2	300 µmol
Copper Sulphate (CuSO ₄ ·5H ₂ O)	1.4	45 µmol
Diluent	Complete to 2500 ml	-

Source: National Guidelines for the Facility-based Management of Children with Severe Acute Malnutrition in Bangladesh

Ensure all ingredients are accurately weighed and thoroughly mixed. The final solution should be used as directed in milk feeds for children receiving treatment for severe malnutrition.

11.3. Recipes for the F-75 starter and F-100 catch-up formulas:

The recipes for F-75, a starter formula, are provided based on the availability of wheat flour and are demonstrated by a top chef from DSH Hospital. These formulas are crucial for the initial phase of nutritional rehabilitation in children with severe malnutrition.

Table 13: F-75 Recipe Using Dried Whole Milk:

Ingredient	Amount for F-75
Dried Whole Milk	35 g
Sugar	70 g
Cereal Flour*	35 g
Vegetable Oil (e.g., Soybean Oil)	20 g (or 20 ml)
Electrolyte Mineral Mix	20 ml
Water	Make up to 1000 ml

Source: National Guidelines for the Facility-based Management of Children with Severe Acute Malnutrition in Bangladesh

11.4. Recipes for F-75 when cooking facilities and/or cereal flour are unavailable, as well as for F-100 formulas

In areas where cereal flour is not readily available, alternative F-75 and F-100 formula compositions are used. The following tables provide the formulations for these scenarios:

Table 14: F-75 Recipes for Unavailable Cereal Flour

Type of Milk	Ingredients	Amount for F-75	Amount for F-100
Dried Whole Milk			
	Dried Whole Milk	35 g	110 g
	Sugar	100 g	50 g
	Vegetable Oil	20 g (or 20 ml)	30 g (or 35 ml)
	Electrolyte/Mineral Mix	20 ml	20 ml
	Water	Make up to 1000 ml	Make up to 1000 ml
Full-Cream Cow's Milk (Fresh or Long Life)			
	Full-Cream Cow's Milk	300 ml	880 ml
	Sugar	100 g	75 g
	Vegetable Oil	20 g (or 20 ml)	20 g (or 20 ml)
	Electrolyte/Mineral Mix	20 ml	20 ml
	Water	Make up to 1000 ml	Make up to 1000 ml

Source: National Guidelines for the Facility-based Management of Children with Severe Acute Malnutrition in Bangladesh

11.5. Feed amounts according to F-75 for kids with severe oedema

The following lists the F-75 feed volumes for kids with severe oedema. For kids who don't have extremely bad(++) oedema

Table 15: Children with Severe Oedema F-75 Volumes

Weight of child (KG)	The volume of F-75 per feed (ml)			Daily total (100 ml/kg)	80% of daily total a (minimum)
	Every 2 hours ^b	Every 3 hours ^c	Every 4 hours (6 feeds) ^d		
3.0	25	40	50	300	240
3.2	25	40	55	320	255
3.4	30	45	60	340	270
3.6	30	45	60	360	290
3.8	30	50	65	380	305
4.0	35	50	65	400	320
4.2	35	55	70	420	335
4.4	35	55	75	440	350
4.6	40	60	75	460	370
4.8	40	60	80	480	385
5.0	40	65	85	500	400
5.2	45	65	85	520	415
5.4	45	70	90	540	430
5.6	45	70	95	560	450
5.8	50	75	95	580	465
6.0	50	75	100	600	480
6.2	50	80	105	620	495
6.4	55	80	105	640	510
6.6	55	85	110	660	530
6.8	55	85	115	680	545

7.0	60	90	115	700	560
7.2	60	90	120	720	575
7.4	60	95	125	740	590
7.6	65	95	125	760	610
7.8	65	100	130	780	625
8.0	65	100	135	800	640
8.2	70	105	135	820	655
8.4	70	105	140	840	670
8.6	70	110	145	860	690
8.8	75	110	145	880	705
9.0	75	115	150	900	720
9.2	75	115	155	920	735
9.4	80	120	155	940	750
9.6	80	120	160	960	770
9.8	80	125	165	980	785
10.0	85	125	165	1000	800
10.2	85	130	170	1020	815
10.4	85	130	175	1040	830
10.6	90	135	175	1060	850
10.8	90	135	180	1080	865
11.0	90	140	185	1100	880
11.2	95	140	185	1120	895
11.4	95	145	190	1140	910
11.6	95	145	195	1160	925
11.8	100	150	195	1180	940
12.0	100	150	200	1200	960

11.6. Volume range for F-100 free feeding

Table 16: F-100's 4 hourly volume range (6 feeds daily)

Weight of child kg	Minimum (ml)	Maximum (ml)	Minimum (150/ml/kg/day)	Maximum (220 ml/kg/day)
2.0	50	75	300	440
2.2	55	80	330	484
2.4	60	90	360	528
2.6	65	95	390	572
2.8	70	105	420	616
3.0	75	110	450	660
3.2	80	115	480	704
3.4	85	125	510	748
3.6	90	130	540	792
3.8	95	140	570	836
4.0	100	145	600	880
4.2	105	155	630	924
4.4	110	160	660	968
4.6	115	170	690	1012
4.8	120	175	720	1056
5.0	125	185	750	1100
5.2	130	190	780	1144
5.4	135	200	810	1188
5.6	140	205	840	1232
5.8	145	215	870	1276
6.0	150	220	900	1320
6.2	155	230	930	1364

6.4	160	235	960	1408
6.6	165	240	990	1452
6.8	170	250	1020	1496
7.0	175	255	1050	1540
7.2	180	265	1080	1588
7.4	185	270	1110	1628
7.6	190	280	1140	1672
7.8	195	285	1170	1716
8.0	200	295	1200	1760
8.2	205	300	1230	1804
8.4	210	310	1260	1848
8.6	215	315	1290	1892
8.8	220	325	1320	1936
9.0	225	330	1350	1980
9.2	230	335	1380	2024
9.4	235	345	1410	2068
9.6	240	350	1440	2112
9.8	245	360	1470	2156
10.0	250	365	1500	2200
These columns' volumes are rounded to the closest five milliliters.				

Source: National Guidelines for the Facility-based Management of Children with Severe Acute Malnutrition in Bangladesh

11.7. Record of Observation:

Regularly monitor respiratory rate, pulse, and temperature every 2-4 hours until the patient stabilizes in F-100. Once stability is achieved, the frequency of monitoring can be reduced, such as to twice a day. Be vigilant for signs of distress, including an increasing heart rate and respiratory rate, rapid or labored breathing, sudden spikes or drops in temperature, axillary temperature below 35°C, and any other notable changes in the patient's condition.

CHAPTER 12

CASE STUDY

12.1. Case Study 1

Tina, an 18-month-old girl under the care of a SAM facility, exhibits noticeable thinness in her arms and shoulders. She presents severe edema in both feet, lower legs, and face. Despite no signs of diarrhea or vomiting, her eyes remain clear. Tina weighs 3.5 kg and is unresponsive. Her blood sugar level measures 2.5 mmol/L.

Advice

Tina is experiencing hypoglycemia, with a blood sugar level of 2.5 mmol/L, which is considerably below the normal range for a child of her age. Typically, normal blood glucose levels for an 18-month-old child range from 3.3 mmol/L to 5.6 mmol/L.

Immediate medical attention is crucial to address Tina's hypoglycemia, particularly considering her severe edema and non-responsiveness. The following steps should be taken:

- a. Transport Tina promptly to a healthcare facility for thorough evaluation and treatment.
- b. In cases of severe hypoglycemia, the fastest and most effective treatment is the administration of intravenous (IV) glucose, a procedure that should be carried out by a healthcare professional. The rate and amount of glucose administered will depend on her specific condition and the healthcare provider's assessment.
- c. It is imperative to identify and address the underlying cause of Tina's hypoglycemia. Given her age and symptoms, malnutrition and severe acute malnutrition (SAM) appear to be contributing factors.
- d. Nutritional support, including therapeutic feeding, is essential to address her malnutrition.

12.2. Case Study 2

Kalpana, a 3-year-old girl, arrives at the hospital exhibiting significant lethargy and is in a state of shock. She shows minimal interest in eating. With a weight of 4.5 kg and a z-score below -3, she is categorized as severely underweight. Additionally, her pulse rate is elevated at 180, indicating severe dehydration.

Advice

Kalpana, a 3-year-old girl, is severely dehydrated and in a state of shock, requiring immediate treatment to prevent further complications. She will be administered intravenous fluids using the New WHO ORS Solution with a concentration of 337.5 mmol/L to restore blood volume.

and blood pressure. The infusion may be delivered through a peripheral IV line or, if necessary, through a central line.

It is crucial to closely monitor Kalpana's vital signs, encompassing heart rate, respiratory rate, blood pressure, and temperature. Additionally, careful observation for signs of dehydration, such as dry skin and mucous membranes, as well as reduced urine output, is essential.

Following stabilization of Kalpana's condition, efforts will focus on addressing the root cause of her shock. This may involve the administration of antibiotics if there is an infection or surgical intervention in the case of internal injuries.

12.3. Case Study 3

Polash, at the age of 3y, exhibits a z-score below -3.5, indicating severe underweight status. He presents with edema in both feet and shows signs of shock and other complications. His current weight is 6 kg.

Advice

Ensure the child is positioned safely and stably, lying down if necessary. Pay attention to their airway, breathing, and circulation. In cases of shock, consider the administration of fluids or blood products to restore blood pressure and circulation. If the child is experiencing difficulty breathing or has low oxygen levels, providing oxygen may be necessary. For those in shock or dehydrated, IV fluids may be required to reestablish fluid balance and blood pressure. The selection of fluids and the rate of administration will be determined by the specific clinical situation.

Nutritional support is vital for malnourished children, and this may involve special formulas or feeds to supply essential nutrients. Once the cause of edema, low weight, and other complications is identified, appropriate treatment will commence. This could include addressing infections, managing chronic illnesses, or implementing other necessary interventions.

Recommended antibiotics for reducing shock include:

- Ampicillin 300mg
- Amoxicillin 90 mg
- Gentamicin 4.5 mg

12.4. Case Study 4

Irina, a 25-month-old girl, was admitted to the hospital on February 22. She is severely anemic and exhibits other micronutrient deficiencies. Additionally, she is severely wasted, with a weight of 7.5 kg and a height of 120 cm.

Advice

This could include a transfusion of blood if her hemoglobin level is exceptionally low. Irina may also require supplementation with iron, folic acid, and vitamin B12. Providing her with multivitamin supplements or other supplements tailored to address her specific deficiencies may be part of the plan. Initiating a high-calorie, high-protein diet is essential. If she struggles to consume enough orally, alternative feeding methods such as through a nasogastric tube or gastrostomy tube may be necessary.

Treatment for Irina's micronutrient deficiency:

- 200,000 IU of vitamin A
- Multivitamin without Iron
- 1 mg of Folic Acid per day (administer 5 mg on day 1)
- 15 mg of Zinc
- 2.25 mg of copper.

CHAPTER 13

DISCUSSION AND CONCLUSION

13.1. Discussion

This internship report aims to examine the impact of conditions like hunger on the growth and development of children. The study suggests the necessity for both dietary assistance and medical interventions. The garment industry in Bangladesh has the potential to contribute to overall health and development. DSH, a specialized school for children, can provide enhanced care and financial support. Government funding is allocated to state hospitals at the third level of care. The main goal of this endeavor is to enhance the existing child health facilities in this hospital, widely utilized across the country, for an even greater improvement in the nation's health.

13.2. Conclusion

My experience at DSH was meticulously planned and has significantly contributed to my learning. I believe I have effectively applied the new skills and knowledge acquired through practical experience and leisure activities in various aspects of my job. Concerning children's health, the impact of hunger is detrimental and could result in elevated death and illness rates among children in Bangladesh and other low-income and emerging nations.

A substantial number of children in these regions suffer from illnesses such as malaria and face food scarcity. Approximately 80% of the youth in Bangladesh come from rural areas and lack essential knowledge and care, leading to fatal consequences. Collaborative efforts involving volunteer groups, the Government of Bangladesh, and funding from organizations for reducing the likelihood of child illness and death is the goal of the World Vision organization, the United Kingdom (UK), and the United Nations Children's Fund (UNICEF).

Dedicated initiatives are in place to address the challenges of hunger and diarrhea, ensuring the well-being of the population. The organization not only assists children with diarrhea but also endeavors to enhance their overall diet. Various food items, including F-75, F-100, milk Soji, rice Soji, khichuri, halwa, and other nutritious treats, are provided to alleviate hunger in children. Additionally, parents of young children receive support, motivation, and nutritional guidance from the organization. The overarching objective of the hospital is to provide superior care to its patients.

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