

# Nutritional care for Patients with Ebola Virus Disease in Ebola Treatment Units

## **Frequently Asked Questions on Nutrition and Ebola Virus Disease**

(Plus other filovirus diseases such as Marburg Virus Disease  
and Lassa Fever)

## **Acknowledgements**

This guidance was initiated as a result of a question posed to the Global Nutrition Cluster Technical Alliance and based on previous work done on this topic<sup>[1]</sup>. It was completed by a Taskforce on the nutritional care of Ebola patients in Ebola Treatment Units established under the umbrella of the Alliance with funding support from UNICEF. It was coordinated and co-chaired by John Hopkins University/CDC and WHO. We would like to acknowledge Cinthya Moshtagh and Mija Ververs for their contributions to the writing of earlier drafts. We also like to express gratitude to Theresa Li for her specific inputs in the food system section. We are grateful to Kerstin Hanson for her substantial work on writing and finalizing the latest version of the guidance as well as Julia D'Aloisio for her editing inputs. In addition, we would like to thank Janet Diaz, Anaïs Legand, Jamie Rylance, and Victoria Willet (WHO) for their helpful additions.

We acknowledge the following Taskforce Members (in alphabetical order) for their generous contributions in discussing, reviewing and/or editing for technical content of this guidance: Andrew Beckingham, Suzanne Brinkman, Megan Coffee, Kिररily de Polnay, Tracy Kelly, Willy Mavula Mbemba, Emmanuel Kalufenye Ngengele, Tolbert Nyenswah, Indi Trehan and Mija Ververs.

## **About the GNC Technical Alliance:**

The GNC Technical Alliance is a technical assistance platform that responds to technical requests, by leveraging and building on existing nutrition resources, capacities, initiatives, and coordination structures. The Alliance supports practitioners by delivering the following services: 1. Access to high-quality information, capacity-strengthening resources, guidance and research that has been curated by global nutrition specialists and agencies; 2. Where guidance is limited, timely access to interim consensus-driven guidance for emerging technical issues in humanitarian nutrition, including guidance on program adaptation; 3. Access to experienced nutrition technical specialists to answer questions, or to provide more in-depth support (remote or in-country). The Alliance is led by UNICEF and co-led by World Vision International and supported by a leadership team composed of UNICEF Programme Division, WVI, the GNC-CT, Emergency Nutrition Network (ENN) and Action Against Hunger Canada (ACF-Ca). For more information, visit: <https://ta.nutritioncluster.net/>

---

<sup>[1]</sup> Ververs M, Anantharam P. Nutritional Care For Patients With Ebola Virus Disease In Ebola Treatment Units: Past And Current Experiences. US Dep Health Hum Serv Cent Dis Control Prev. Published online August 26, 2019:28.

Ververs M, Gabra M. Nutritional Care for Patients with Ebola Virus Disease. *Emerg Infect Dis.* 2020;26(1):20-25. doi:10.3201/eid2601.191024

Ververs M, Vorfeld C. Guidance materials from 2014 to 2019 on nutritional care for Ebola patients in Ebola Treatment Units: an analysis. *Public Health Nutr.* 2021;24(1):139-145. doi:10.1017/S136898002000261X

## Table of Contents

<b>Introduction</b> .....	<b>1</b>
<b>General 1. What are the key aspects of nutritional care in Ebola Treatment Units (ETUs)?</b> .....	<b>6</b>
<b>General 2. What are the principal roles required for ensuring quality nutritional care in Ebola Treatment Units (ETUs)?</b> .....	<b>10</b>
<b>General 3. What special considerations should be taken to provide individual feeding support to Ebola Treatment Unit (ETU) patients?</b> .....	<b>14</b>
<b>General 4. How should nutritional care be monitored in an ETU?</b> .....	<b>16</b>
<b>General 5. What are the recommendations for addressing nutritional needs of convalescent patients upon Ebola Treatment Unit (ETU) discharge?</b> .....	<b>19</b>
<b>Patient Care 1. How should a nutritional assessment be carried out in an Ebola Treatment Unit (ETU)?</b> .....	<b>21</b>
Annex 1. Tips for assessing food tolerance and appetite (children 6 months of age and older).....	26
Annex 2. Food tolerance and appetite test - decision tree.....	27
Annex 3. Feeding support assessment.....	28
<b>Patient Care 2. What are general dietary recommendations and food suggestions for Ebola Treatment Unit (ETU) patients (of all ages and population groups)?</b> .....	<b>29</b>
Annex 1. Weekly menu examples for solid and semi-solid diets (must be properly adapted and blended for semi-solid diet).....	35
Annex 2. Examples of breakfast, lunch and dinner recipes for solid and semi-solid diets (must be properly adapted and blended for semi-solid diet).....	37
<b>Patient Care 3. How should infant and young child feeding (including breastfeeding) be managed in Ebola Treatment Units (ETUs)?</b> .....	<b>41</b>
<b>Patient Care 4. When and how should specialized nutrition products be used in Ebola Treatment Units (ETUs)?</b> .....	<b>48</b>
Annex 1. Recipe for BP100porridge.....	55

<b>Patient Care 5. When should nasogastric tube feeding or total parenteral nutrition be used in Ebola Treatment Units (ETUs)?</b> .....	<b>56</b>
<b>Patient Care 6. What are the dietary recommendations for Ebola Treatment Unit (ETU) patients with diarrhoea and/or vomiting and subsequent electrolyte abnormalities?</b> .....	<b>59</b>
Annex 1. Recipes for rice water and rice porridge.....	61
Annex 2. Foods rich in potassium.....	62
Annex 3. Foods and drinks that are rich in calcium or sodium.....	64
<b>Food Systems 1. How should meal preparation and food/drink distribution be managed in ETUs? (ETU food system)</b> .....	<b>68</b>
<b>Food Systems 2. Where should ETU meals be prepared?</b> .....	<b>71</b>
<b>Food Systems 3. What measures should be taken to ensure proper food hygiene in Ebola Treatment Units (ETUs)?</b> .....	<b>72</b>
Annex 1. Food storage checklist.....	77
Annex 2. Food hygiene during preparation checklist.....	79
<b>FAQ Food Systems 4. How should food be safely transported to and within an Ebola Treatment Unit (ETU)?</b> .....	<b>82</b>
<b>Food Systems 5. What instructions can be provided to families and friends who want to provide meals for an Ebola Treatment Unit (ETU) patient?</b> .....	<b>85</b>
Annex 1. Suggestions for families/friends wishing to provide meals for an ETU patient.....	86
<b>References for ETU Nutritional Care FAQs</b> .....	<b>88</b>

# Frequently Asked Questions on Nutrition and Ebola Virus Disease

(Plus other filovirus diseases such as Marburg Virus Disease and Lassa Fever):

## INTRODUCTION

A theme that has emerged consistently in interviews with professionals from past Ebola Virus Disease (EVD) outbreaks is the difficulty in knowing how to provide nutritional care in Ebola Treatment Units (ETUs); particularly, what type of nutritional care is feasible and how it can be balanced with the other clinical demands of a high-risk zone.<sup>1</sup> The lack of research and evidence-based recommendations on the provision of nutritional care in ETUs has made it challenging to develop guidance on this topic. However, given the regular recurrence of EVD outbreaks, further practical guidance is needed to support health practitioners.

This series of Frequently Asked Questions (FAQs) is meant to provide guidance on the provision of nutritional care in ETUs where recommendations are currently lacking or to aid the implementation of existing recommendations.

**These FAQs could be relevant to other infectious diseases with clinical syndromes similar to Ebola that are managed in isolation facilities, particularly diseases caused by other filovirus' such as Marburg and Lassa.**

These FAQs are 'living' documents and will be updated when new recommendations and/or evidence become available.

The guidance provided in this series is based on WHO recommendations (where available) and other currently available evidence. In the absence thereof, this guidance is derived from:

- Guidance materials on nutritional care for patients in ETUs developed between 2014 and 2020 and comparative analyses of these materials.<sup>1,3,6-25,26,28,29,4,30</sup>
- Experiences captured from health practitioners who have worked in ETUs, particularly during the 2013–2016 EVD outbreak in West Africa and during more recent outbreaks between 2018 and 2020 in the Democratic Republic of the Congo.<sup>1</sup>
- Guidance on nutritional support for comparable diseases or disease settings.

The contents of this FAQ series have been peer-reviewed by health practitioners working in ETUs (e.g., clinicians, nurses and nutritionists).

Although many aspects of nutritional care for ETU patients are universal, adjustments can be made according to context and the availability and accessibility of resources. The guidance presented in these FAQs responds to a relatively ‘ideal situation’, recognizing that this is not always feasible and that compromises are often necessary.

**Table 1** below summarizes the FAQs currently featured in the series. They have been grouped into three themes: General (G), Patient Care (PC), Food System (FS). Other FAQs are in progress and these documents will be updated when new information becomes available. **Figure 1** below summarises where in the patient journey these FAQs can be considered.

**Table 1. FAQ titles according to theme**

<b>GENERAL</b>
G1. What are the key aspects of nutritional care in ETUs?
G2. What are the principal roles required for ensuring quality nutritional care in ETUs?
G3. What special considerations should be taken to provide individual feeding support to ETU patients?
G4. How should nutritional care be monitored in an ETU?
G5. What are the recommendations for addressing nutritional needs of convalescent patients upon ETU discharge?
<b>PATIENT CARE</b>
PC1. How should a nutritional assessment be carried out in an ETU?
PC2. What are general dietary recommendations and food suggestions for ETU patients?
PC3. How should infant and young child feeding (including breastfeeding) be managed in ETUs?
PC4. When and how should specialized nutrition products be used in ETUs?
PC5. When should nasogastric tube feeding or total parenteral nutrition be used in ETUs?
PC6. What are the dietary recommendations for ETU patients with diarrhoea or vomiting and subsequent electrolyte abnormalities?
PC7. What drugs have nutrition interactions in ETUs?
<b>FOOD SYSTEM</b>
FS1. How should meal preparation and distribution be managed in ETUs?
FS2. Where should ETU meals be prepared?
FS3. What measures should be taken to ensure proper food hygiene in ETUs?
FS4. How should food be safely transported to and within ETUs?
FS5. What instructions can be provided to families and friends who want to provide meals for an ETU patient?

**Figure 1: The nutritional care patient journey through an ETU and where to consider using these FAQs**



## References

1. Ververs M, Anantharam P. Nutritional Care For Patients With Ebola Virus Disease In Ebola Treatment Units: Past And Current Experiences. *US Dep Health Hum Serv Cent Dis Control Prev*. Published online August 26, 2019:28.
2. Ververs M, Vorfeld C. Guidance materials from 2014 to 2019 on nutritional care for Ebola patients in Ebola Treatment Units: an analysis. *Public Health Nutr*. 2021;24(1):139-145. doi:10.1017/S136898002000261X
3. World Health Organization, World Food Programme, United Nations Children's Fund (UNICEF). *Interim Guideline: Nutritional Care of Children and Adults with Ebola Virus Disease in Treatment Centres*. World Health Organization; 2014.
4. Kodish SR, Rohner F, Beauliere JM, et al. Implications of the Ebola virus disease outbreak in Guinea: Qualitative findings to inform future health and nutrition-related responses. McDermid JM, ed. *PLOS ONE*. 2018;13(8):e0202468. doi:10.1371/journal.pone.0202468
5. World Health Organization. *Guidelines for the Management of Pregnant and Breastfeeding Women in the Context of Ebola Virus Disease*. World Health Organization; 2020.
6. Outbreaks | Ebola (Ebola Virus Disease) | CDC. Published November 2021. <https://www.cdc.gov/vhf/ebola/outbreaks/index-2018.html>
7. Ververs M, Gabra M. Nutritional Care for Patients with Ebola Virus Disease. *Emerg Infect Dis*. 2020;26(1):20-25. doi:10.3201/eid2601.191024
8. International Medical Corps (IMC). *Nutrition Guidelines for Ebola Treatment Centers*; 2014.
9. GOAL. *International Package of Tools and Protocols for Ebola Treatment Units*; 2014.
10. International Committee of the Red Cross (ICRC). *Nutrition Care Protocols for Ebola Virus Disease (EVD) Patients - Liberia Experience*. Draft version 9.; 2015.
11. International Federation of the Red Cross (IFRC). *Ebola Treatment Center Standard Operating Procedures*; 2015.
12. Partners in Health (PIH). *Nutritional Care for Patients at Maforki Ebola Holding and Treatment Center*. Version 2.2.; 2015.
13. Save the Children. *ETC Nutrition Protocol - Kerry Town Ebola Treatment Centre*. V2 ed.; 2015.
14. International Committee of the Red Cross (ICRC), Médecins Sans Frontières (MSF OCB/OCG). *Nutritional Protocol for Patients Infected with Ebola Virus Disease*. v 3.; 2016.
15. Médecins Sans Frontières (MSF). *2018 Filovirus Disease Guidelines - Draft, Appendix X: Nutritional Tools for Patients Infected with Filovirus Disease*; 2018.
16. Government of Sierra Leone. *Sierra Leone Emergency Management Program Standard Operating Procedure for Food Distribution to Quarantined Households, Holding and Treatment Centers - Sierra Leone Emergency Management Program Standard Operating Procedure for Nutritional Support*. Version 1.; 2014.
17. Ministry of Health and Social Welfare, Republic of Liberia. *Guidelines on Nutritional Care and Support for EVD Patients in Treatment Units and Care Centers - A Practical Guide for Implementing Agencies Involved in the Management and Treatment of EVD in Liberia*; 2014.
18. Ministry of Health and Social Welfare, Republic of Liberia. *Updated Guideline on Infant and Young Child Feeding in an Emergency - Guideline in the Context of Ebola Virus Disease Outbreak in Affected Counties of Liberia*; 2014.
19. République Démocratique du Congo, Ministère de la Santé, Programme National de Nutrition (PRONANUT), with support from UNICEF and the WHO. *Strategie Conjointe de Prise En Charge Nutritionnelle et Alimentaire Dans Le Cadre de La Reponse a l'Epidemie de Maladie a Virus Ebola Dans Les Zones de Sante de Bikoro, Iboko, Ntondo, Mbandaka et Wanganta a l'Equateur, RDC*; 2018.
20. République Démocratique du Congo, Ministère de la Santé, Programme National de Nutrition (PRONANUT), with support from UNICEF. *Protocole de Soins Nutritionnels Chez Le Adultes et Les Enfants Avec Maladie a Virus Ebola (MVE) Hospitalisés Aux Centres de Traitement (CTE)*; 2018.
21. République Démocratique du Congo, Ministère de la Santé, Programme National de Nutrition (PRONANUT), with support from UNICEF. *Manuel d'Orientation Sur La Promotion, La Protection et Le Soutien a l'Alimentation Du*



- Nourisson et Du Jeune Enfant En Communauté Dans Le Contexte de l'Epidémie de La Maladie à Virus Ebola à l'Est de La République Démocratique Du Congo.; 2019.
22. UNICEF. Food and nutrition component of direct EVD Response – Liberia, Guinea, Sierra Leone. Presented at: unknown.
  23. World Health Organization. *Clinical Management of Patients with Viral Haemorrhagic Fever: A Pocket Guide for Front-Line Health Workers: Interim Emergency Guidance for Country Adaptation*. World Health Organization; 2016.
  24. World Health Organization. *Optimized Supportive Care for Ebola Virus Disease: Clinical Management Standard Operating Procedures*. World Health Organization; 2019.
  25. Smit MA, Michelow IC, Glavis-Bloom J, Wolfman V, Levine AC. Characteristics and Outcomes of Pediatric Patients With Ebola Virus Disease Admitted to Treatment Units in Liberia and Sierra Leone: A Retrospective Cohort Study. *Clin Infect Dis Off Publ Infect Dis Soc Am*. 2017;64(3):243-249. doi:10.1093/cid/ciw725
  26. Uyeki TM, Mehta AK, Davey RTJ, et al. Clinical Management of Ebola Virus Disease in the United States and Europe. *N Engl J Med*. 2016;374(7):636-646. doi:10.1056/NEJMoa1504874
  27. McClave SA, Taylor BE, Martindale RG, et al. Guidelines for the Provision and Assessment of Nutrition Support Therapy in the Adult Critically Ill Patient: Society of Critical Care Medicine (SCCM) and American Society for Parenteral and Enteral Nutrition (A.S.P.E.N.). *JPEN J Parenter Enteral Nutr*. 2016;40(2):159-211. doi:10.1177/0148607115621863
  28. Mehta NM, Skillman HE, Irving SY, et al. Guidelines for the Provision and Assessment of Nutrition Support Therapy in the Pediatric Critically Ill Patient: Society of Critical Care Medicine and American Society for Parenteral and Enteral Nutrition. *Pediatr Crit Care Med J Soc Crit Care Med World Fed Pediatr Intensive Crit Care Soc*. 2017;18(7):675-715. doi:10.1097/CMC.0000000000001134
  29. te Loo DM, van der Graaf F, Ten WTA. The effect of flavoring oral rehydration solution on its composition and palatability. *J Pediatr Gastroenterol Nutr*. 2004;39(5):545-548. doi:10.1097/00005176-200411000-00018
  30. Medina-Rivera M, Centeno-Tablante E, Finkelstein JL, et al. Presence of Ebola virus in breast milk and risk of mother-to-child transmission: synthesis of evidence. *Ann N Y Acad Sci*. 2021;1488(1):33-43. doi:10.1111/nyas.14519

## **FAQ General 1. What are the key aspects of nutritional care in Ebola Treatment Units (ETUs)?**

Ebola Virus Disease (EVD) is a life-threatening multisystem illness that frequently leads to hypovolemia, metabolic acidosis, hypoglycemia, and multi-organ failure.<sup>1</sup> Poor nutrition can result from and aggravate the disease process. Ebola Treatment Unit (ETU) patients therefore require simultaneous medical and nutritional care.<sup>2</sup>

### ***How does EVD interfere with nutrition?***

Many common EVD symptoms interfere directly with food intake and nutrition and/or increase nutritional requirements; notably fever, fatigue, anorexia, vomiting, diarrhoea, nausea, abdominal pain, difficulty swallowing, sore throat and hiccups.<sup>3,4</sup> Loss of appetite is a particularly serious impediment to meeting the increased nutritional needs of EVD patients and compensating for nutritional losses. Encephalopathy can also play a major role in limiting nutrition; patients become disoriented and forgetful, and often need to be reminded to continue to eat and drink. General weakness can make simple actions, such as holding water bottles, opening food containers or using cutlery, very challenging for an EVD patient. Without caretaker support for these tasks, they may be demotivated to eat.

EVD symptoms are similar among different age groups.<sup>5</sup> Among young children, who cannot easily communicate, symptoms may manifest only as poor feeding or suckling, but can have potentially dangerous implications if not identified and acted on.<sup>6</sup>

### ***What is the importance of nutritional care for EVD patients?***

Although the lack of specific research<sup>7</sup> has made it difficult to define the best practices for nutritional care in ETUs, the importance of good nutrition in fighting infection is well known. Researchers and practitioners have also emphasized the need for good nutritional care for EVD patients.<sup>7,8</sup> Furthermore, adequate nutrition is essential in the management of critical illness or sepsis,<sup>7</sup> whether a patient has EVD or not.

EVD patients have varied nutritional needs, depending on the stage of illness and the individual patient's underlying nutritional status.<sup>3</sup> Maintaining or re-establishing optimal nutritional status improves response to treatment.<sup>7,8</sup> All efforts should be made to avoid malnutrition. For patients who already present with or develop malnutrition, food and drinks should be introduced and adjusted carefully to manage the reductive adaptation associated with malnutrition, in addition to the systemic physiologic burden of EVD.

Maintaining adequate hydration is also crucial for EVD management and continued oral rehydration with nutritionally appropriate products is important for optimal care, even when IV rehydration is being provided.

Beyond their clinical importance, food and nutrition are also very meaningful aspects of social practice and emotional well-being. Food preferences and habits are closely linked to religious beliefs, culture and social values.<sup>3</sup> Interviews with survivors and practitioners have emphasized the importance of an ETU's reputation among the local population and the impact it has on health care seeking behavior. Rumours about poor and/or inadequate food in ETUs can undermine messaging to seek testing and/or accept transfer to ETUs.

### ***What are the basic principles of nutritional care in an ETU?***

Providing nutritional support should be a priority in the care of ETU patients, especially children.<sup>6</sup> An adapted diet should be provided for all patients depending on their clinical condition. **In critically ill patients with severe dehydration, nutritional support should not interfere with fluid volume and electrolyte replacement strategies. At this stage, the correction of dehydration takes precedence over the patient's diet.**

Nutritional care in ETUs must include provision of individualized food and drinks and assistance to consume them. A well-functioning food delivery system must accompany high-quality patient care. A regular cycle of assessment, monitoring, and re-adjustment of all components of nutritional care is essential to ensure that patient needs and quality standards are being met.

All patients admitted to an ETU should receive a full nutritional assessment (See FAQ PC1) to define the individual nutritional care required. The evaluation should include dietary needs (including nutritional status), dietary preferences, and need for feeding support.

Cases of acute malnutrition should be managed according to national protocols for the treatment of acute malnutrition.

Solid, semi-solid, and liquid diet options should be prescribed according to needs identified in the nutritional assessment. Since most patients with active disease have poor appetite, soft foods and fluids are generally easiest to tolerate.<sup>3</sup> For descriptions of different dietary options based on food consistency (solid, semi-solid, liquid) see FAQ PC2.

Previous interim guidance materials have suggested use of maintenance, transition, and boost phases<sup>3</sup> for nutrition care. These phases have not been included in the present FAQ series, wherein nutritional intake focuses on age category and type of diet tolerated (liquid, semi-solid, or solid). Field teams can decide which model is most helpful for provision of nutritional care in their respective context.

Efforts to motivate patients to eat, without adding stress, are key to recovery. Fluid intake is also essential and should be encouraged with every meal or snack and whenever possible. During recovery, EVD patients often have an increased appetite and additional food should be provided accordingly.

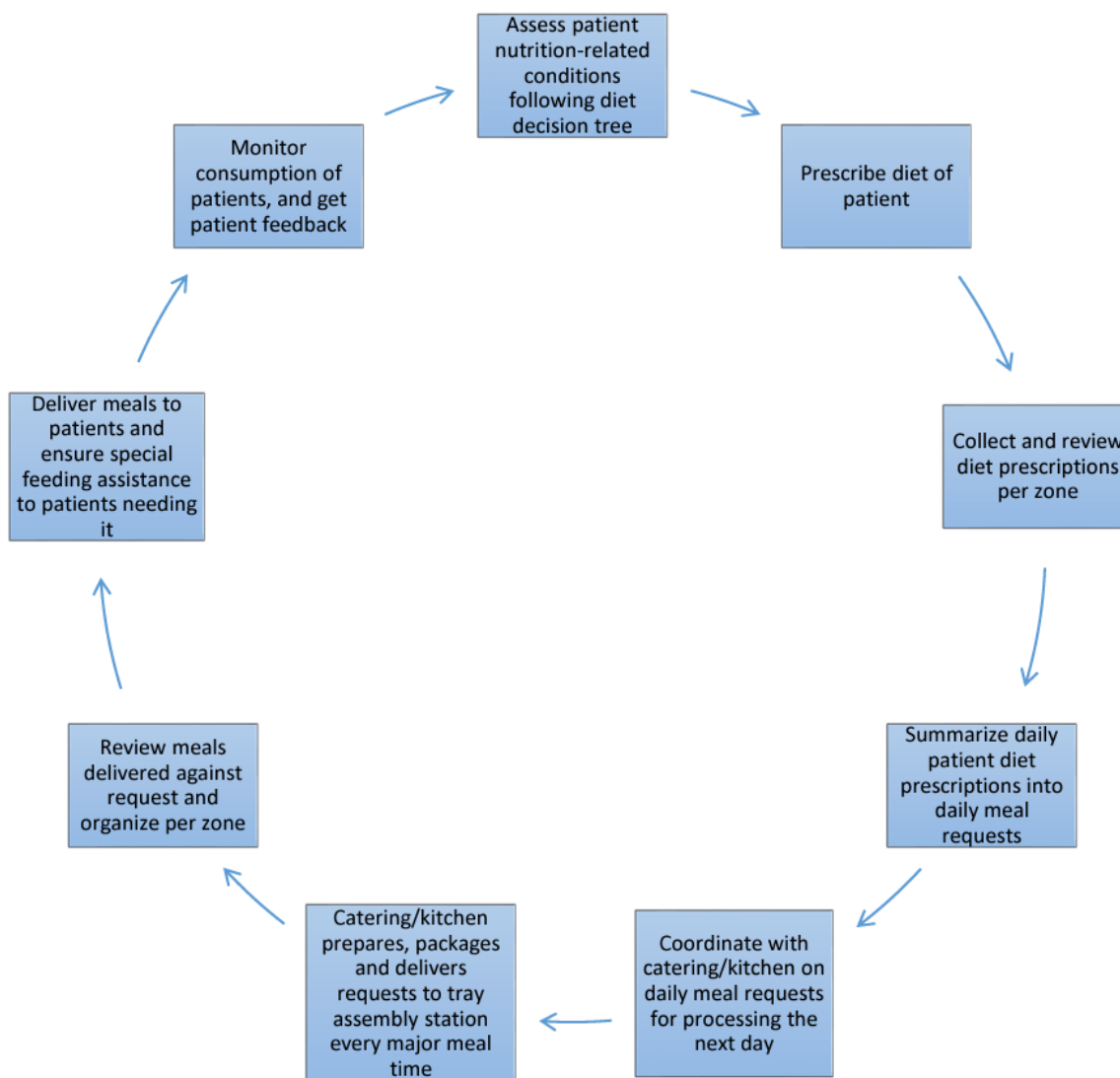
Once an EVD patient has been declared cured through consecutive negative PCR tests, discharge planning should begin. Proper attention should be given to help ensure that discharged convalescent patients will continue to consume nutritionally rich meals upon leaving the ETU (see FAQ G5). If this will

not be possible with the private resources available to the patient, he or she should be referred to appropriate support services or the ETU itself should provide discharge rations/survivor support.

**How is nutritional care in an ETU organized?**

Nutritional care of ETU patients includes aspects of direct patient care as well as the food system that provides appropriate foods and drinks to patients. The nutritional care process is a system that intends to guide and link staff involved in these different aspects of the nutritional care and support of ETU patients. It describes the major activities affecting the nutritional assessment, diagnosis, intervention and monitoring of patients. See FAQ FS1 for more on the ETU food system.

**Figure 1: Nutritional care process in ETUs<sup>9</sup>**



## References

1. World Health Organization. *Optimized Supportive Care for Ebola Virus Disease: Clinical Management Standard Operating Procedures*. World Health Organization; 2019.
2. République Démocratique du Congo, Ministère de la Santé, Programme National de Nutrition (PRONANUT), with support from UNICEF. *Protocole de Soins Nutritionnels Dans Le Context de La Maladie a Virus Ebola and République Democratique Du Congo*.; 2019.
3. World Health Organization, World Food Programme, United Nations Children's Fund (UNICEF). *Interim Guideline: Nutritional Care of Children and Adults with Ebola Virus Disease in Treatment Centres*. World Health Organization; 2014.
4. Lamunu M, Olu OO, Bangura J, et al. Epidemiology of Ebola Virus Disease in the Western Area Region of Sierra Leone, 2014-2015. *Front Public Health*. 2017;5:33. doi:10.3389/fpubh.2017.00033
5. Dixit D, Masumbuko Claude K, Kjaldgaard L, Hawkes MT. Review of Ebola virus disease in children – how far have we come? *Paediatr Int Child Health*. 2021;41(1):12-27. doi:10.1080/20469047.2020.1805260
6. World Health Organization. *Clinical Management of Patients with Viral Haemorrhagic Fever: A Pocket Guide for Front-Line Health Workers: Interim Emergency Guidance for Country Adaptation*. World Health Organization; 2016.
7. Ververs M, Gabra M. Nutritional Care for Patients with Ebola Virus Disease. *Emerg Infect Dis*. 2020;26(1):20-25. doi:10.3201/eid2601.191024
8. Ververs M, Anantharam P. Nutritional Care For Patients With Ebola Virus Disease In Ebola Treatment Units: Past And Current Experiences. *US Dep Health Hum Serv Cent Dis Control Prev*. Published online August 26, 2019:28.
9. Ministry of Health and Social Welfare, Republic of Liberia. *Guidelines on Nutritional Care and Support for EVD Patients in Treatment Units and Care Centers - A Practical Guide for Implementing Agencies Involved in the Management and Treatment of EVD in Liberia*.; 2014.

## **FAQ General 2. What are the principal roles required for ensuring quality nutritional care in Ebola Treatment Units (ETUs)?**

Numerous tasks are involved in optimizing nutritional care for EVD patients. Table 1 provides an overview of principal roles and suggested responsibilities for both patient care and the food system components of nutritional care.

Every context will differ, and roles/responsibilities should be carefully adapted to fit the specific set-up, needs, and human resource capacities of any individual ETU. Roles can be combined and responsibilities shifted as needed. Tasks and responsibilities can be divided among clinical staff, EVD survivors/caretakers, nutritionists/dieticians, health support staff, etc. as needed and integrated into various job descriptions.

Regardless of task distribution, all roles must be clearly defined and well communicated to the parties involved. Reporting lines should be well established.

Experience has shown the importance of having a senior person who is accountable for the nutritional care of patients (including food systems-related tasks)<sup>1</sup> – essentially a Nutrition Care Manager. This person can be an experienced nurse or a qualified nutritionist or dietician. It is essential that this individual is part of the clinical team responsible for case management.

All ETU staff have a role in relaying any nutrition-related information or concerns (from patients or based on their own observations) to the Nutrition Care Manager. Table 1 provides an overview of various roles that need to be fulfilled. Depending on the size of the ETU and bed occupancy, some roles can be combined. For example, if the number of patients is limited, the tasks of the Nutrition Supervisor can be either merged with the Nutrition Case Manager or with the Nurse Aid.

Collecting and discarding food and drink leftovers is not included as a task in the table as this should be the responsibility of the infection prevention and control (IPC) or water, sanitation and hygiene (WASH) team.

**Table 1. Potential roles and responsibilities for ETU nutritional care** (adapted<sup>2</sup>)

Role	Major responsibilities/tasks
Nutrition Care Manager	<ul style="list-style-type: none"> <li>• Manages the entire ETU nutritional care system and oversees its quality assurance and control (including regular monitoring)</li> <li>• Is responsible for creating and standardizing locally adapted recipes to meet patient preferences and nutritional requirements (in collaboration with nutrition and catering/kitchen supervisors)</li> <li>• Reviews and signs off on weekly menus</li> <li>• Trains and supervises all staff engaged in nutrition-specific aspects of patient nutritional care</li> <li>• Is the technical focal point concerning contracts with catering services and food suppliers</li> <li>• Trains appropriate ETU health care workers on nutritional assessment, prescribing diets for patients based on illness severity (including level of dehydration), symptoms, level of appetite, and presence or absence of eating difficulties</li> <li>• Ensures a context appropriate for safe and practical food preparation, distribution and consumption</li> <li>• Makes appropriate adjustments to the nutritional care system based on patient and staff feedback and regular monitoring</li> <li>• Is responsible for allocation and stock management of all specialized nutrition food products</li> <li>• Is the technical focal point on feeding of infants</li> </ul> <p>Qualifications: Clinical Nutritionist or Dietitian or Nurse with substantial nutrition/food systems experience</p>

Role	Major responsibilities/tasks
Nutrition Supervisor*	<ul style="list-style-type: none"> <li>• Supervises and/or conducts patient nutritional assessments (in collaboration with Nurse Aides)</li> <li>• Coordinates, reviews, and validates diet prescriptions provided by clinicians from the different ETU zones and monitors daily consumption of patients</li> <li>• Plans, organizes, and coordinates patient meal and snack distribution and feeding plan</li> <li>• Calculates and plans the number of meals and specialized foods provision (in collaboration with the Catering/Kitchen Supervisor)</li> <li>• Assists with creating and standardizing locally adapted recipes</li> <li>• Responsible for creating weekly menus, including calculating and planning number of meals (in collaboration with Catering/Kitchen Supervisor)</li> <li>• Prepares specialized nutritional products for distribution to patients</li> <li>• Supervises and assists with tray assembly preparation and food distribution</li> <li>• Ensures proper application of the standard operating procedures for food brought in by families/friends</li> <li>• Implements the standard operating procedures for newly admitted breastfeeding women</li> </ul>
Nurse Aid	<ul style="list-style-type: none"> <li>• Assists the Nutrition Supervisor with assessing and monitoring feeding support needs</li> <li>• Organizes and provides feeding support for any patient requiring it (e.g., patients needing assistance with positioning, patients requiring direct feeding support, young children and infants separated from mothers) - with support from EVD caretakers</li> <li>• Assists the Nutrition Supervisor with meal and snack distribution</li> <li>• Monitors food/drink intake of patients and provides feedback to Nutrition Supervisor</li> <li>• Assists Nursing Manager or Supervisor with other tasks as needed</li> <li>• Assists the Nutrition Supervisor with assessing and monitoring nutritional needs (including taking anthropometric measurements to assess nutritional status) and dietary preferences</li> <li>• Assists the Nutrition Supervisor with meal and snack distribution</li> <li>• Assists Nursing Manager or Supervisor with other tasks as needed</li> </ul>



Role	Major responsibilities/tasks
Catering/Kitchen Supervisor	<ul style="list-style-type: none"> <li>• Coordinates and monitors hygienic preparation and packaging of patient meals according to quantity and consistency required following the approved menu plan (catering or in-house preparation)</li> <li>• Liaises with catering services, food suppliers, etc. and handles their contracts</li> <li>• Is responsible for stock management of non-specialized food products and non-food items such as utensils, packaging materials, etc.</li> <li>• Supervises and coordinates quality control checks (in collaboration with IPC/WASH staff) of the in-house kitchen and/or catering service providers</li> <li>• In the context of food insecurity, conducts weekly market surveys on the availability of local ingredients</li> <li>• Assists with creating and standardizing locally adapted recipes</li> <li>• Assists with creating weekly menus, including calculating and planning number of meals</li> <li>• Assists the Nutrition Supervisor at the tray assembly line</li> </ul>

\*If bed occupancy is relatively small, this role can be merged with the Nutrition Care Manager or Nurse Aid.

## References

1. WHO, Ministry of Health DRC, UNICEF (2019). Ebola Nutrition Lesson Learning Workshop – 13th to 16th May 2019, Goma DRC.
2. Ministry of Health and Social Welfare, Republic of Liberia. *Guidelines on Nutritional Care and Support for EVD Patients in Treatment Units and Care Centers - A Practical Guide for Implementing Agencies Involved in the Management and Treatment of EVD in Liberia.*; 2014.

### **FAQ General 3. What special considerations should be taken to provide individual feeding support to Ebola Treatment Unit (ETU) patients?**

Staff responsible for distributing meals should provide each patient with their assigned meal and provide the individualized care necessary for patients to meet their daily dietary and hydration requirements. Patients should be gently encouraged to consume all food and drink provided. Additional support, whether physical or psychological, may be needed for individual patients, depending on their clinical condition and feeding needs.<sup>1</sup> See FAQ PC1 for the assessment of need for feeding support.

Due to the infectious nature of EVD, ETU patients are unable to receive physical support from family and friends. However, provisions for family support should be made where possible, involving no contact areas where families/friends can at least verbally encourage patients to eat and drink and give other emotional support. Physical assistance with feeding can thus only be provided by health care staff and/or EVD survivors hired as caretakers, (as long as they are trained and with an adequate level of PPE supplied).<sup>2,3</sup> Due to the high workload and strict regulations, health care staff have limited time to assist patients with eating or drinking. The support of recovering ETU patients and survivors is therefore essential in providing adequate feeding support.<sup>4</sup>

In order to provide the necessary feeding support for all patients, it is important to calculate and plan for the number of staff that should enter the high-risk zone during meal and snack times. In general, 15-30 minutes should be allocated to patients unable to feed themselves (including infants, young children and sicker older patients).

#### **Physical support**<sup>1,4-6</sup>

Some patients can benefit from specific equipment and materials to assist with positioning (e.g., sitting support or cushion) or food intake (e.g., straw, cup and spoon).

- Patients should be positioned in an upright or half-sitting (semi-supine) position. Equipment such as triangles of wood with foam can be helpful.
- If the patient has difficulty swallowing or generalized weakness, liquid should be offered through a straw or with disposable cup and spoon (or via syringe for children).
- Some patients may require direct physical support by a caretaker or health worker (i.e., assistance with actual feeding).
- Dedicated time and support should accompany each meal, snack or drink that is provided. For mealtimes, this should be at minimum 15 minutes,<sup>1</sup> ideally 30 minutes for patients with poor appetite or swallowing difficulties;<sup>5</sup> the time can be shorter for snacks and drinks.
- Patients should be fed slowly, with water/drinks offered between bites.
- Infants and young children require feeding support, adapted to their age and clinical status. EVD survivors hired as caretakers are particularly helpful for this population.
- Ensure that the food being provided is appropriate for the age and status of the child.
- See FAQ PC3 for dietary recommendations for children <2 years old, including Annex 1 for instructions on cup feeding children receiving breastmilk substitutes.

- Even if a child is physically able to feed him/herself, it may be important for someone to stay at the bedside to provide verbal assistance and encouragement.
- Some children might feel more comfortable sitting on the lap of the staff or caregiver to eat/drink.

### Psychological support<sup>1,5</sup>

Some patients with Ebola may be confused or forgetful due to the effects of EVD. It is therefore important to encourage and remind patients to continue eating and drinking. Frequent encouragement is also key in enabling patients with decreased appetite and/or with difficulties swallowing to start eating. Encouragement should be given any time staff members are with a patient.

- Health staff and caretakers should behave compassionately and take time to communicate with patients through simple discussions and messages, kind words and body language (listening carefully; nodding to demonstrate understanding).
- Food intake should be promoted in a way that supports the patient and avoids adding stress.<sup>2</sup>
- Staff should explain how patients can minimize pain while eating, such as eating small amounts at a time, and resting and taking drinks between spoonful's.
- Patients should be encouraged to eat small amounts, increasing gradually.
- Health staff and caretakers should explain what each meal is composed of and how proper nutrition contributes to the patient's treatment/care. This is particularly important if the diet consists of specialized nutrition products that the patient may not be familiar with.
- The consistency of foods should be explained to patients and they should be told why they are being prescribed a specific diet. Simple explanations can be as follows: "It is a meal specially prepared to help you eat and be able to fight the disease"; "Soft meals provide similar nutrition as standard meals but they are prepared to be softer to allow patients to eat more easily"; "By eating well, you replace essential nutrients you have lost due to the disease"; "You can't take your medicine with an empty stomach so please take food before"; "This food helps your body to fight disease; it strengthens your body's immunity".

### References

1. Save the Children. *ETC Nutrition Protocol - Kerry Town Ebola Treatment Centre*. V2 ed.; 2015.
2. World Health Organization, World Food Programme, United Nations Children's Fund (UNICEF). *Interim Guideline: Nutritional Care of Children and Adults with Ebola Virus Disease in Treatment Centres*. World Health Organization; 2014.
3. Ververs M, Anantharam P. Nutritional Care For Patients With Ebola Virus Disease In Ebola Treatment Units: Past And Current Experiences. *US Dep Health Hum Serv Cent Dis Control Prev*. Published online August 26, 2019:28.
4. Ministry of Health and Social Welfare, Republic of Liberia. *Guidelines on Nutritional Care and Support for EVD Patients in Treatment Units and Care Centers - A Practical Guide for Implementing Agencies Involved in the Management and Treatment of EVD in Liberia.*; 2014.
5. International Committee of the Red Cross (ICRC). *Nutrition Care Protocols for Ebola Virus Disease (EVD) Patients - Liberia Experience*. Draft version 9.; 2015.
6. GOAL. *International Package of Tools and Protocols for Ebola Treatment Units.*; 2014.

## **FAQ General 4. How should nutritional care be monitored in an ETU?**

A proper monitoring system is an important part of the Nutritional Care Process (see FAQ G1). It has two main purposes:<sup>1,2</sup>

- 1) Assess the quality, efficacy and acceptability of the nutritional care provided.
- 2) Observe trends in admissions and patient dietary and feeding requirements (e.g., number of patients on solid/semi-solid/liquid diets; feeding assistance needs) to facilitate resource planning.

A well-designed monitoring system should address all aspects of nutritional care, including both the food system and patient care. It is an essential tool for prompt adaptation and improvement.

### ***Approaches used to monitor the functioning of the food system:***<sup>1,2</sup>

1. Observation and supervision:
  - Monitor staff understanding of and compliance with pertinent protocols (this implies that staff have received proper training or briefing beforehand)
  - Evaluate quality of feeding support (appropriateness, availability, adequacy) as well as problems that prevent adequate support
  - Perform weekly visits to the high-risk area for observation and random interviews with patients regarding their experience of meals and nutrition in the ETU
  - Assess patient awareness, appreciation and acceptability of the nutritional care provided (including food, drinks and feeding support)
2. Regular and frequent discussions with staff involved in any step of the food system.
3. Systematic weekly collection and analysis of pertinent data/information, including reviewing the nutritional care register\*

\*Each nursing or food station should have a booklet in which direct and indirect observations can be registered daily. Pertinent information should be recorded after meal and snack times, and any time in between. The following information can be included: Overall quantity of food and drink consumed, foods that were consumed/not consumed, food/drink preferences and other feedback from patients, whether the correct meals were served (e.g., correct consistency and dietary needs), whether the meal was served on time, and any other helpful observations or information.<sup>1</sup>

### ***Food preferences***

Measures to promote oral food intake by patients should be a priority. Special attention should therefore be given to evaluate patients' perceptions and preferences regarding the food/drinks that are offered (for clinical reasons and for the ETU's reputation, which affects health care seeking and

willingness to be admitted in an ETU). This can be facilitated through informal, regular surveys, ensuring that information is gathered from a sample of patients receiving all types of diets. Surveys can address a specific meal or food/drink option in general. Below are a few suggestions on what to include in such a survey.<sup>3</sup>

For specific meals:

- What kind of diet is the patient prescribed (solid, semi-solid, liquid)?
- What foods/drinks were included in the meal?
- What did the patient like about the meal?
- What did the patient dislike about the meal?
- How did the patient feel about the following (circle response, provide details when possible):
  - Presentation (liked/disliked)
  - Smell (liked/disliked)
  - Overall taste (liked/disliked)
  - Spiciness (liked/disliked)
  - Texture (liked/disliked)
  - Temperature (liked/disliked)
  - Other (i.e., favourite/familiar/sentimental food)
- What suggestions does the patient have for improving meal service?

In general:

- What kind of diet is the patient prescribed (solid, semi-solid, liquid)?
- What foods/drinks does the patient like/tolerate best (for meals and snacks), and why?
- What foods/drinks does the patient dislike or not tolerate (for meals and snacks), and why?
- What suggestions does the patient have for improving meal service?

Special consideration should be given to food texture, as patients might experience difficulties with eating and swallowing.

Personal reasons for food preferences (e.g., family food, emotional component attached to specific foods and taste preferences, foods with 'medicinal properties' according to customs) should be elicited and noted.

**Note:** During the course of the disease individual perceptions on food/consumption might change and it will be important to monitor these changes.

### ***Monitoring individual patient food/drink intake***

Beyond its essential role in the overall ETU's nutritional care process, monitoring is also essential for individual patient care. After each meal and snack, health or nutrition care staff should estimate food/drink intake (see \* above). Total amount consumed should be evaluated daily to establish whether it is sufficient or not.

If food/drink consumption is not adequate, it is important to establish possible causes and make any adjustments to help alleviate them (e.g., change diet consistency, adjust size/frequency/timing of meals

and snacks, provide additional support). Caretakers who support patient feeding should be instructed in how to help monitor food/drink intake and flag when intake is inadequate.

## References

1. International Committee of the Red Cross (ICRC). *Nutrition Care Protocols for Ebola Virus Disease (EVD) Patients - Liberia Experience*. Draft version 9.; 2015.
2. Save the Children. *ETC Nutrition Protocol - Kerry Town Ebola Treatment Centre*. V2 ed.; 2015.
3. Ministry of Health and Social Welfare, Republic of Liberia. *Guidelines on Nutritional Care and Support for EVD Patients in Treatment Units and Care Centers - A Practical Guide for Implementing Agencies Involved in the Management and Treatment of EVD in Liberia*.; 2014.

## FAQ General 5. What are the recommendations for addressing nutritional needs of convalescent patients upon Ebola Treatment Unit (ETU) discharge?

Discharge planning should begin when the patient is clinically stable and while samples are being sent off for PCR testing to confirm they are free of Ebola virus. The following recommendations should be considered to ensure proper nutritional care upon discharge.

- 1) ETU patients are at high risk of developing acute malnutrition. **All convalescent patients** should thus have a nutritional status assessment (see FAQ PC1) prior to discharge.
- 2) Upon leaving the ETU, **convalescent patients with acute malnutrition** should:
  - Be referred to the appropriate treatment facility per national treatment protocol and based on location and availability.
  - Receive food commodities as suggested in the national treatment protocol.<sup>1</sup> If such a protocol does not exist, provide the patient with sufficient food to cover dietary needs for 15 days (to ensure there is adequate nutrition until follow-up at a treatment facility). Ready-to-use therapeutic food (RUTF) (2–3 sachets/day) will likely be the best option for children and Super Cereal (250 g/day)<sup>1</sup> the best option for adults.
- 3) Ebola outbreaks have detrimental consequences on household food security; it is therefore worthwhile to assess what household nutrition support is needed and most appropriate. This should be done for **all convalescent patients**, regardless of nutritional status. The following options can be considered:
  - Ideally a survivor care programme should be implemented and offer access to care and support to all EVD survivors. Nutritional support should be included as part of the programme's activities.
  - Depending on the context, the recovered patient's family should receive cash, vouchers and/or food rations that are nutritionally adequate and sufficient for the whole household for 1-3 months to improve household food insecurity during the recovery period.
  - Where available, the patient and family should be referred to humanitarian partners providing appropriate food and other required assistance.
  - If there are concerns about poor food diversity in the household, consider providing a one-month supply of multi-micronutrient tablets for the convalescent patient.<sup>2</sup>
  - Although not directly related to nutrition, non-food item needs should also be considered when addressing household food security, as purchasing these items can divert funds away from purchasing adequate and appropriate food. Indeed, experience has shown that non-food items are sometimes preferred over food. There may be a particular need for clothes, blankets and mattresses, as those previously used by the patient have most likely been destroyed. Cash or voucher assistance may be the most preferred option. Lastly, convalescent patients should also receive psycho-social support.

- 4) For **convalescent women who are still lactating**, consult WHO recommendations<sup>1</sup>. A woman who has recovered from EVD, cleared viremia and wants to continue breastfeeding should wait until after two consecutive negative EBOV breastmilk tests by RT-PCR, separated by 24 hours. During this time, the child should be given a breastmilk substitute.
- 5) **Convalescent children <2 years of age** require special attention. Upon discharge from an ETU, children under 2 years of age should be referred for regular health and nutritional status monitoring (e.g., at the local health centre, infant and young child feeding facility, or other). In addition:
  - Caregivers should be provided with infant feeding counselling and support according to the infant's age (including complementary feeding for infants ≥6 months of age).
  - If the child will be breastfed upon discharge, ensure that breastfeeding will be safe and adequate (i.e., mother's milk is negative for EVD, child accepts and latches appropriately, milk supply is sufficient).
  - If the child will require a breastmilk substitute (to support all or some of the child's milk needs, whether temporarily or permanently), provide caregivers with appropriate counselling for minimizing risks. Discuss how and what kind of breastmilk substitute will be provided. A formal modus operandi should be discussed, and contact should be made with the Ministry of Health and/or UNICEF as is most appropriate according to context. Instructions should be provided for safe and hygienic preparation and feeding.

## References

1. World Health Organization, World Food Programme, United Nations Children's Fund (UNICEF). *Interim Guideline: Nutritional Care of Children and Adults with Ebola Virus Disease in Treatment Centres*. World Health Organization; 2014.
2. World Health Organization. *Clinical Management of Patients with Viral Haemorrhagic Fever: A Pocket Guide for Front-Line Health Workers: Interim Emergency Guidance for Country Adaptation*. World Health Organization; 2016.

---

<sup>1</sup> <https://www.who.int/publications/i/item/9789240001381>



## FAQ Patient Care 1. How should a nutritional assessment be carried out in an Ebola Treatment Unit (ETU)?

### *What should be included in a nutritional assessment?*

A comprehensive nutritional assessment is important for gathering the information required to provide quality and individualized nutritional care to ETU patients. Assessment should include **dietary needs**, **dietary preferences** and **need for feeding support**.

The assessment should be done as soon as possible following admission. Timing may depend on clinical status of patient and staff availability (i.e., adequate time should be devoted to the assessment to ensure all essential information can be captured accurately).

Nutritional care for ETU patients should be carefully monitored and adjusted as needed. Regular re-assessment of patient needs and preferences is a crucial as part of this (see FAQ G4). The nutritional assessment can be completed by any healthcare worker who has been appropriately trained. Carrying out nutritional assessments should be an assigned responsibility to ensure that it is done systematically.

### **1. Dietary needs**

The nutritional management of ETU patients should meet basic (maintenance) nutritional requirements / dietary needs and address or minimize the impact of EVD.

Dietary needs are based on the following nutrition-related conditions:<sup>1,2</sup>

- Age
- Nutritional status (see Table 1 below)
- Pre-existing co-morbidities (e.g., diabetes, hypertension, physical disability)
- Presence and level of dehydration
- Severity of illness
- Presence of metabolic disturbance and/or electrolyte imbalance
- Level of appetite
- Ability to eat and drink / presence of swallowing difficulties
- For children <2 years old: Breastfeeding status – exclusive, mixed (breastfeeding + other milk), complementary (breastfeeding + complementary foods), or not currently breastfed.

When a patient's clinical status is appropriate for feeding, food tolerance<sup>3</sup> and appetite should be assessed. This will help establish whether: 1) a patient's body can handle oral intake (food tolerance); and 2) the patient is ready/wanting to eat/drink (appetite). It is also important to evaluate the patient's physical ability to eat and identify any difficulties or obstacles to eating beyond appetite (see below for feeding support). These factors will help determine the required consistency of foods (e.g., liquid, semi-solid, solid). Whenever possible, food tolerance and appetite should be assessed with a regular meal and at regular mealtime (see Annex 1 and 2 for details). For infants <6 months of age, food tolerance and appetite should be evaluated via a breastfeeding assessment or while feeding an appropriate breastmilk substitute.

## **2. Dietary preferences**

Patients are more likely to eat food that aligns with their preferences and habits. This is essential for patient nutrition and helps decrease the quantity of uneaten food left at the bedside (thus creating less hazardous material and less work for infection prevention and control teams). Receiving and consuming preferred foods can also help patient morale.

Patients should be asked what foods and drinks they like and don't like, so that individual preferences can be accommodated whenever possible and used to inform general meal and recipe planning (see FAQ G4 for more information regarding patient preferences). Non-consumed food and drinks should be recorded and an attempt should be made to understand why they were not consumed.

## **3. Requirements for feeding support**

EVD patients can be very sick and weak and may require physical assistance to eat/drink. Young children, in particular, generally require help to eat and drink, as they are often separated from parents and familiar caretakers.

The type of support required can vary widely, depending on clinical condition and feeding needs. Some patients may benefit from specific equipment and materials to assist with positioning (e.g., sitting support or a cushion that can be easily sanitized) or food intake (e.g., straw, cup and spoon). Other patients may require direct physical support by a caretaker or health worker (i.e., assistance with actual feeding). In some cases, patients may benefit from medication to support feeding (i.e., anti-nausea or heartburn medication).<sup>4</sup>

Patients should be assessed upon admission and daily thereafter to determine what kind of support they require to facilitate feeding. See Annex 3 on feeding support assessment.



Examples of physical support tools to facilitate dietary intake<sup>1</sup>

### How to do a nutritional assessment?

**Nutritional status** is assessed via a **patient’s weight, the appropriate age-dependent anthropometric indicator** (see Table 1), and **presence/absence of nutritional oedema**.

Patients identified with acute malnutrition should be managed according to the national protocol for the management of acute malnutrition, with special consideration of the patient’s EVD status.<sup>2</sup>

**Table 1. Suggested anthropometric indicators for assessing nutritional status, and associated nutritional status classification, according to age category**

Age category	Anthropometric indicators	Nutritional status classification
<6 months old	WAZ*	<a href="https://www.who.int/tools/child-growth-standards/standards/weight-for-age">https://www.who.int/tools/child-growth-standards/standards/weight-for-age</a>
	WHZ	<a href="https://www.who.int/tools/child-growth-standards/standards/weight-for-length-height">https://www.who.int/tools/child-growth-standards/standards/weight-for-length-height</a>
6–59 months old	MUAC	Severe acute malnutrition: <115 mm Moderate acute malnutrition: ≥115 and <125 mm No acute malnutrition >125mm
	WHZ	<a href="https://www.who.int/tools/child-growth-standards/standards/weight-for-length-height">https://www.who.int/tools/child-growth-standards/standards/weight-for-length-height</a>
5–17 years old**	BMI-for-age	<a href="https://www.fantaproject.org/tools/bmi-look-up-tables">https://www.fantaproject.org/tools/bmi-look-up-tables</a>
≥18 years old	BMI = Weight (kg)/Height (m <sup>2</sup> )	Severe acute malnutrition: <16 kg/m <sup>2</sup> Moderate acute malnutrition: ≥16 and <18.5 kg/m <sup>2</sup>
Pregnant women	MUAC	<230 mm <sup>3</sup> to be considered for nutritional support

MUAC (mid-upper arm circumference); WHZ (weight-for-height z-score); WAZ (weight-for-age z-score); BMI (body mass index)

\* Some organizations use MUAC/age for infants <6 months of age. See <https://www.ennonline.net/ourwork/research/mami>

\*\*Some national nutrition protocols may also use MUAC for children >5 years of age and adults; refer to these if useful and/or appropriate.

**NOTE:** The types of measures that can be undertaken will be dependent on available equipment, staff capacity and patient caseload; however, all efforts should be made to take accurate measurements to enable efficient assessment and follow-up.

### **Taking anthropometric measures:**

- **Weight:**
  - Weigh all patients.
  - Cover scales in plastic and change them before after each patient. If plastic is not feasible, sanitize the scale after each patient.<sup>2</sup>
  - Regularly calibrate scales and put them to zero before each use.
  
- **Height:**
  - Attempt to ascertain height for all patients; this is most important for non-pregnant adults (for calculating BMI).
  - Ask the patient his or her height; take a measurement if height unknown or uncertain.
    - Use appropriate instruments for measurement, according to age and clinical status. For patients  $\geq 2$  years old and able to stand, use height (measured standing up); for patients  $< 2$  years or unable to stand, use length (measured lying down).
    - Sanitize instruments after each patient.
  
- **Mid-upper arm circumference (MUAC):**
  - Take MUAC of all children 6–59 months of age and pregnant women. (NOTE: MUAC may be used for individuals outside of this age range according to national or organizational nutritional protocols).
  - Use disposable tapes, one for each patient. If not possible, sanitize the tape after each patient.

### **Assessing for nutritional oedema (bilateral pitting oedema)**

- Nutritional oedema is a clinical sign of acute malnutrition, especially in children. It may also be a symptom of other medical conditions, especially in adults, so take a careful medical history and always ask where the oedema first appeared.
- Assess nutritional oedema in all patients, particularly in children  $< 5$  years of age.
- Apply pressure bilaterally, hold for a few seconds, then observe for signs of pitting oedema; first in feet (+), then lower legs (++), then arms (+++).

**Table 2. Suggested timing for assessment of nutritional status in ETUs**

	Upon admission	During stay	Upon discharge
<b>Weight</b>	X	Daily or at least every two days*	X
<b>Height</b>	X		
<b>Appropriate anthropometric indicator (see Table 1)</b>	X	If there is weight loss or concerns after feeding re-assessment	X
<b>Nutritional oedema</b>	X	If there is weight loss or concerns after feeding re-assessment	X

\* If using a hanging scale with bucket/pants: Clean with soap and water, rinse and then disinfect with 0.1 per cent chlorine solution, or Sulfanios disinfectant if available. If using electric scales, follow the same process as above but take care not to get liquids into electronic compartments. Wipe over electronic displays rather than putting excessive liquid on them. (From MSF Covid IPC advice).

## ANNEXES

### ANNEX 1. Tips for assessing food tolerance and appetite (children 6 months of age and older)

Provide the patient with an age-appropriate standard/local meal. Ask local staff to help judge meal portions according to local practices.

If it is not possible to perform the assessment with a standard/local meal, use ready-to-use therapeutic food (RUTF) or ready-use-use supplementary food (RUSF) directly from the package or prepared as a porridge. RUTF/RUSF should only be used when a standard/local meal is unavailable, as poor familiarity/acceptability with the product may interfere with accurate assessment (see national protocol for management of acute malnutrition for correct procedure).

A patient has poor **food tolerance** if there are signs of digestive trouble following ingestion of food or drink (e.g., vomiting, abdominal pain, flatulence).

**Appetite** is evaluated as poor, moderate or good depending on the portion of a meal (or sachet of RUTF/RUSF) that a patient is able to consume. Attention should be given to the ability to handle solid foods. If the patient appears to have good appetite but has difficulty handling solid food, adjust food consistency as needed (e.g., liquid, semi-solid or solid diet).

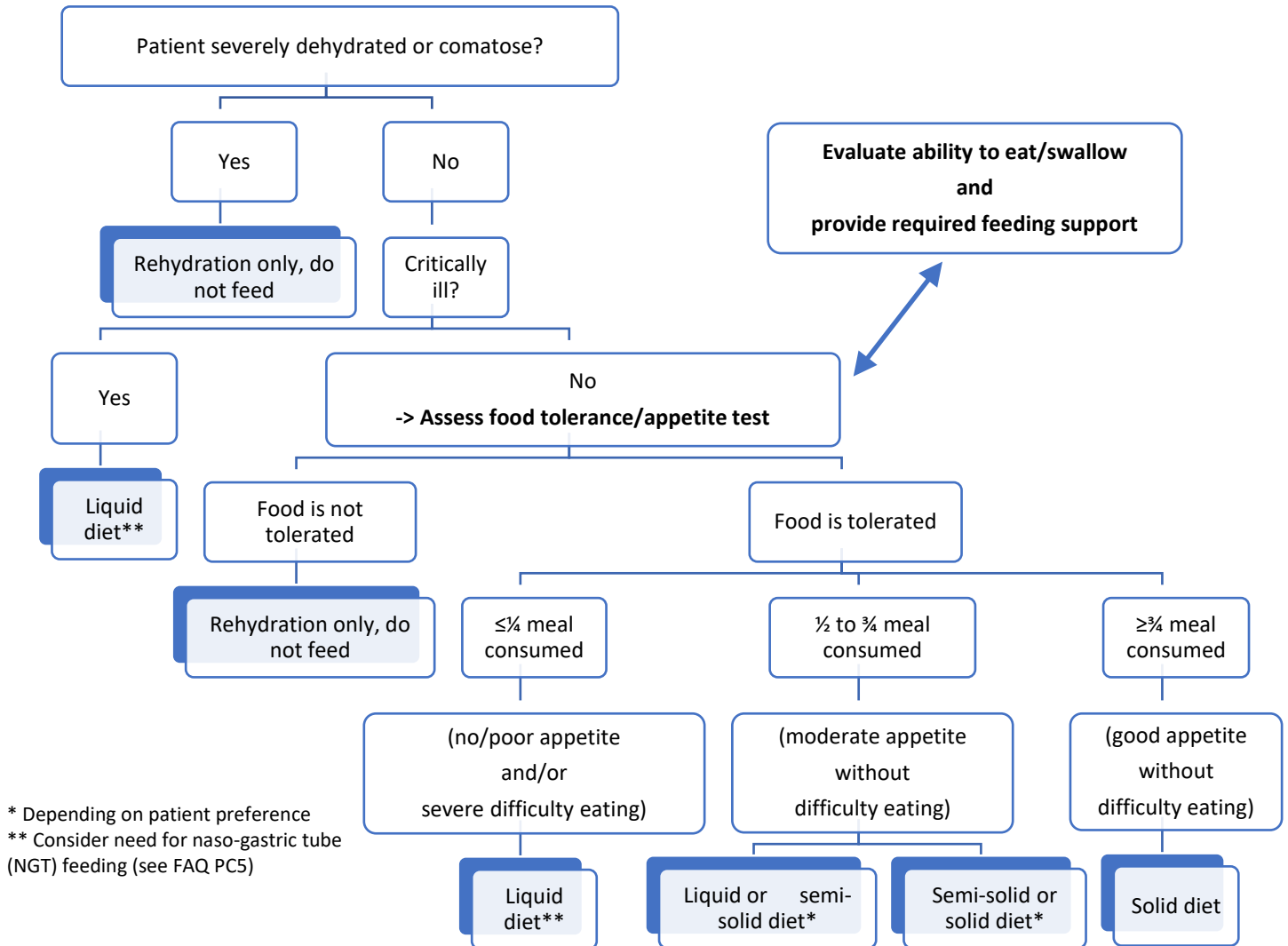
Interpretation of appetite when using a standard meal:

- Consumption of  $< \frac{1}{4}$  of the meal = no/weak appetite
- Consumption of  $\frac{1}{4}$  to  $\frac{3}{4}$  of the meal = moderate appetite
- Consumption  $> \frac{3}{4}$  meal = good (normal) appetite

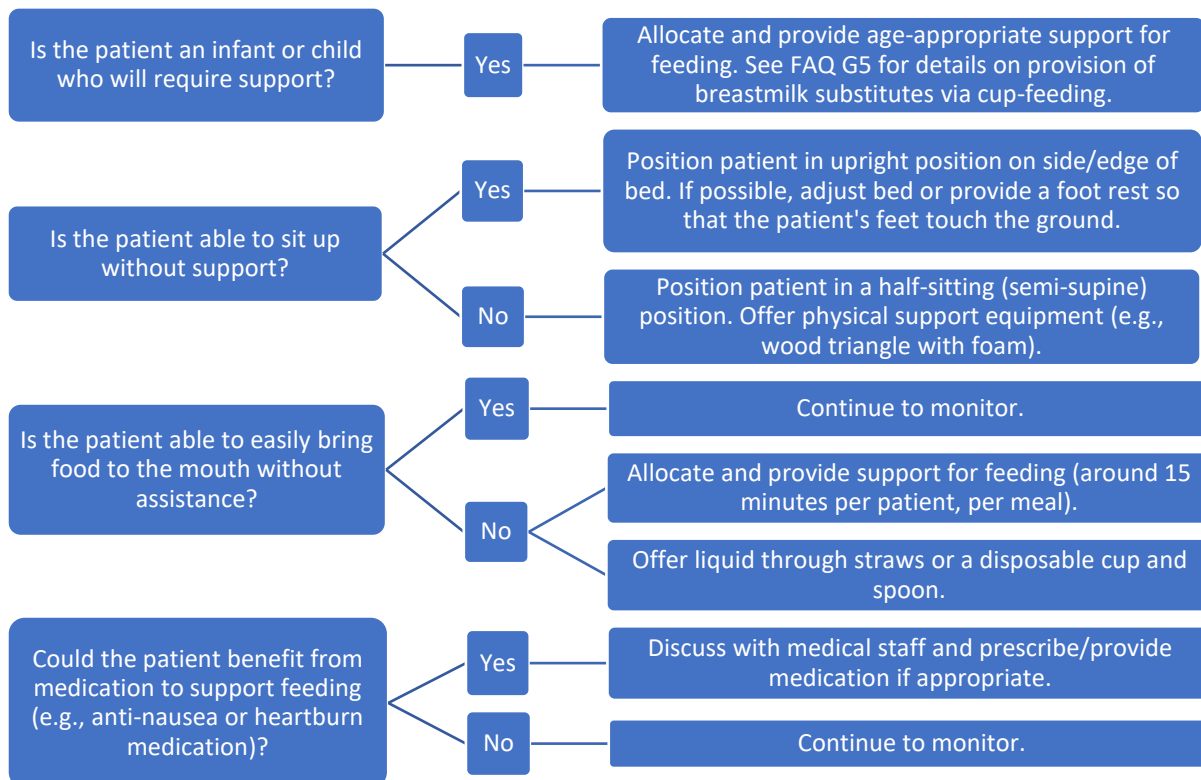
**Table 1. Interpretation of appetite test when using paste form RUTF/RUSF, based on the patient's weight:<sup>5</sup> z(children 6 months of age and older)**

Weight	Minimum amount of RUTF/RUSF sachet (92g) to be consumed for "normal" appetite
<4 kg	At least 1/8 of the sachet
4-6.9 kg	At least 1/4 of the sachet
7-9.9 kg	At least 1/3 of the sachet
10-14.9 kg	At least 1/2 of the sachet
15-30 kg	At least 3/4 of the sachet

**ANNEX 2. Food tolerance and appetite test - decision tree**



### ANNEX 3. Feeding support assessment



### References

1. International Committee of the Red Cross (ICRC), Médecins Sans Frontières (MSF OCB/OCG). Nutritional Protocol for Patients Infected with Ebola Virus Disease. v 3.; 2016.
2. Save the Children. ETC Nutrition Protocol - Kerry Town Ebola Treatment Centre. V2 ed.; 2015.
3. République Démocratique du Congo, Ministère de la Santé, Programme National de Nutrition (PRONANUT), with support from UNICEF. Protocole de Soins Nutritionnels Chez Le Adultes et Les Enfants Avec Maladie a Virus Ebola (MVE) Hospitalisés Aux Centres de Traitement (CTE).; 2018.
4. GOAL. International Package of Tools and Protocols for Ebola Treatment Units.; 2014.
5. République Démocratique du Congo, Ministère de la Santé, Programme National de Nutrition (PRONANUT), with support from UNICEF. Protocole de Soins Nutritionnels Dans Le Contexte de La Maladie a Virus Ebola and Republique Democratique Du Congo; 2019.



## FAQ Patient Care 2. What are general dietary recommendations and food suggestions for Ebola Treatment Unit (ETU) patients (of all ages and population groups)?

### General considerations

Patients in the ETU should receive food and drinks that meet their needs and preferences and have the highest likelihood of contributing to recovery from their disease.

The diet must:

- Contribute to treatment and recovery by:
  - Providing adequate amounts of energy (kcal) and essential nutrients, meeting nutritional needs during different phases of illness
  - Helping to normalize metabolic and electrolyte disturbances (see FAQ PC2)
  - Facilitating hydration
- Have a high likelihood of being consumed, and therefore:
  - Align with patient preferences (in terms of taste, cultural habits, and beliefs regarding the food's contribution to recovery, etc.)
  - Be palatable, attractive and varied (not monotonous)
  - Have the consistency (i.e., liquid, semi-solid or solid) required and preferred by patients
- Not aggravate symptoms, taking into consideration:
  - Diarrhoea – by being cautious of osmolality, dietary fiber, lactose, etc.
  - Risk of liver and kidney impairment – by being cautious of protein and electrolyte intake (in particular, renal solute load)<sup>1</sup>

Type of diet and choice of specific food/drinks should be guided by individual patient nutritional assessments (see FAQ PC1).

Food and drinks can fall into three diet categories according to consistency: **liquid, semi-solid and solid**.<sup>2</sup> A combination diet is also possible. Refer to the food tolerance and appetite test decisional tree in FAQ PC1 Annex 2 for assistance in selecting the proper diet categories for patients.

(NOTE: WHO interim guidance materials suggest using maintenance, transition and boost phases<sup>2</sup> to guide dietary choices, rather than the categories described above. Either approach can be used according to the capacities and preferences of staff in EVD programmes or even at the level of each ETU).

### Special considerations for critically ill patients:

- For critically ill patients with severe dehydration, fulfilling nutritional requirements is a lower priority than rehydration. Strategies to address volume replacement with fluids and electrolytes should take (temporary) precedence, over nutritional support.<sup>4</sup>
- For some critically ill patients, nasogastric feeding with an appropriate liquid diet should be considered. Smaller amounts should be provided initially and increased progressively, as tolerated by the patient<sup>1</sup> (see FAQ PC5 regarding use of nasogastric tubes).

### Recommended daily requirements

Patient diets should be well balanced, providing all essential macronutrients (carbohydrates, protein, and fat) and micronutrients (vitamins and minerals). Each meal should include 2 to 3 different family foods from the following food groups, with all groups being covered each day:

- Starches (staple foods): grains, roots, and tubers.
- Foods of animal source: meat, chicken, fish, liver, eggs, and dairy products.
- Legumes: beans, lentils, peas, and seeds. (Soak beans and legumes prior to cooking to make them softer and more suitable for children to consume).
- Fruits and vegetables (especially those rich in vitamin A): papaya, mango, passion fruit, oranges, dark green leafy vegetables, carrots, pumpkin, and sweet potatoes.

### Energy requirements

Daily energy needs depend principally on age. Table 1 provides estimated ranges for each age group. Lower limits in each range may be more pertinent for patients who are acutely ill and on a liquid diet, while upper limits may be more pertinent for patients who are recovering and on a solid diet. For patients  $\geq 2$  years old, 12 per cent of energy should be from a protein source.<sup>5</sup>

It is important to note that the energy intake recommendations are estimates. Determining the exact caloric content of different foods and of exact quantities of foods consumed by patients may be difficult and laborious. Recommended daily energy needs should help establish targets and guide food and meal planning.

In patients with negligible food intake for more than 5 days, the introduction of food should be managed cautiously to avoid re-feeding issues.<sup>2</sup>

During convalescence (and when there is no risk of a re-feeding syndrome), patients should be encouraged to eat as much as they want and can tolerate (even if this means exceeding the recommended daily intake).<sup>2</sup>

**Table 1. Daily recommended energy intake per age group<sup>6</sup>**

Age	Recommended daily energy intake (kcal)
6–11 months	850–1000
12–23 months	1,000–1200
24–59 months	1,200–1400
5–10 years	1,400–1600
11–18 years	1,600–2000
>18 years	2,000–2600
Pregnant and lactating adolescents and women <sup>7</sup>	Intake for their age + $\geq 300$

### Micronutrient requirements

EVD patients should receive the standard daily requirement of micronutrients; excessive use of micronutrients is not recommended.<sup>8</sup>

If dietary diversity is potentially insufficient to provide the standard daily requirement, micronutrient supplementation may be necessary. Supplementation can be provided through micronutrient tablets or multiple micronutrient powders (see FAQ PC4 for more information on multiple micronutrient powders).

Some studies have suggested the benefit of supplementation with multivitamins<sup>9</sup> and vitamin A<sup>10</sup> on EVD disease course. A retrospective multisite cohort study in Liberia and Sierra Leone during the 2014–2015 Ebola outbreak<sup>9</sup> found that early treatment of EVD patients with oral multivitamins (daily intake <48 hours after admission) resulted in a reduced mortality rate compared with those not treated. Considering the low cost and safety of multivitamin treatment alongside its potential role in clinical improvement, the study authors highly recommend initiating multivitamin treatment in the initial stages of ETU care. The study also emphasized that vitamin A may have had a specific (additional) role related to innate and adaptive immunity.

Children <5 years old who have NOT received vitamin A supplementation in the past 6 months should be offered single dose supplementation.<sup>1,2</sup>

### **Patient preferences**

All attempts should be made to have nutritionally balanced and complete diets using **local/traditional foods** and guided by **local preferences**. As much as possible, offer meals according to a patient's tastes and preferences, while balancing nutritional needs. Use of specialized nutritious products may be necessary to ensure adequate protein and micronutrient intake but should not be the default option (see FAQ PC4).

Field experience with Ebola patients in treatment centres shows wide differences in their capacity to eat and drink, and that appetite can be a driving factor. Presenting patients with choices increases the likelihood that they will eat sufficient quantities of food. When a patient does not like a specific food/drink that is offered, alternatives should be sought. This is facilitated with good logistics and well-resourced treatment units,<sup>2</sup> although high patient numbers may be a limiting factor, even in well-resourced ETUs.

Suggestions for addressing food preferences:<sup>3</sup>

- Assess all local food options, considering supply chain stability and reliability (e.g., visit markets, shops, local providers, etc.).
- Consider local perceptions of comfort or 'medicinal' foods (e.g., ask staff, caregivers (EVD survivors) and patients to gather this information).
- Provide meals that can be adjusted according to individual preferences and needs (i.e., in terms of consistency, taste, specific nutritional requirements). It can be helpful to have a "standard meal" with options for adjustments.
- Consider supporting the families and friends of patients to provide meals. This can positively impact a patient's food consumption and foster a sense of normalcy (see FAQ FS5).<sup>11</sup>
- Ensure a participatory approach with patients and caregivers regarding nutritional care (see FAQ G4 on monitoring the patient's food intake).

ETU staff have reported that EVD patients complain about an altered or impaired sense of taste and have suggested using strong flavours and/or spices. If patients have a normal appetite and complain about lack of taste, specific strong-flavoured food products or spices can be tried out in consultation with patients and nutritionists (whether on site or remotely).

**Past experiences:** During the 2014–2016 Ebola outbreak in West Africa, pepper soup and coconut water were identified as local foods that were preferred and consumed by many adults in ETUs, even patients who were very ill, anorexic and/or unwilling to eat. <sup>1</sup>

### **Meals and snacks**

Three main meals and 2–3 snacks should be provided daily in ETUs.<sup>1,2</sup> (For children <2 years old, refer to FAQ PC3 and national guidance for infant and young child feeding practices).

See Annexes for examples of weekly meal plans and recipes.

### **General considerations**

- Smaller, frequent meals may be more easily tolerated by patients. Consider providing smaller than usual meals, complemented by multiple healthy snacks. Increase the meal portion size for recovering patients.
- Convalescent patients might have increased appetite and should thus be offered an increased volume of meals and snacks, without limit. Priority should be given to energy-dense foods.<sup>5</sup>
- Additional meals should be provided if requested.
- Meals should be served hot and in a timely manner<sup>7</sup> to respect food hygiene measures (see FAQ FS3), but also out of respect for patients and because food is more appetizing when served hot.

### **Solid diet (standard diet)**

Patients with appropriate appetite and ability to eat/swallow should be provided with foods with regular consistency.

*Examples:*<sup>5</sup>

- Breakfast: porridge (e.g., rice, sorghum), bread, local doughnuts, eggs, and soup
- Lunch: standard 'family' meal with staple foods and egg/meat/fish without bones, sauce, pulses, and oil
  - Suggestion of generic recipe for one patient:
    - 150 g starch (e.g., rice, pasta, millet)
    - 80–130 g protein (e.g., chicken, fish, beans, eggs)
    - 70–100 g vegetables
    - Salt + oil
- Dinner: similar to lunch

### **Semi-solid diet**

Patients with moderate appetite and/or difficulty eating/swallowing should be provided with foods that do not require any chewing. With some exceptions, food used for a solid diet can generally also be used for a semi-solid diet. Some foods must simply be mashed or ground up to facilitate eating/swallowing.

*Examples:*<sup>5</sup>

- Breakfast: porridge (e.g., rice, sorghum), fruit/juice, eggs, mashed foods, and soups
- Lunch: soup, mashed version of a standard 'family' meal made with staple foods and egg/meat/fish without bones, sauce, pulses, and oil
- Dinner: similar to lunch

Specialized nutrition products in paste form should not be provided to patients with swallowing difficulties.

### **Liquid diet**

Patients with poor appetite and/or severe difficulty with eating/swallowing should be provided with a liquid diet. Liquid foods/drinks with low osmolarity and low salt content should be provided.<sup>4</sup>

Liquid diets can be an important source of fluids for patients. Consider tracking how much fluid is given this way.

Liquid diets have been problematic for some patients.<sup>3</sup> This is likely due to a combination of factors, including the proposed food commodity (e.g., use of poorly tasting therapeutic milks), monotony of diet, and the patient's clinical condition (i.e., weakness, lack of appetite). These obstacles can be overcome by following patient preferences, providing favourably tasting and varied options, and offering the required feeding support (see FAQ G2 and G3).

*Examples:*<sup>5</sup>

- Soup, broth, yoghurt, highly diluted and blended porridge or pap
- Use of specialized nutrition products (e.g., sip feeds) may be more important and necessary than for those patients needing semi-solid or solid diets (see FAQ PC4).

### **Snacks**<sup>5,13</sup>

A variety of snacks should be available for patients at any time, including throughout the night. For patients with poor or moderate appetite, it may be important to regularly offer snacks between meals as they may not request them.

Snacks should conform with prescribed diet consistency (i.e., liquid, semi-solid, solid).

Night-time snacks should ideally require minimum preparation,<sup>5</sup> be easy to reach and consume, and have low risk of bacterial contamination if left at the patient's bedside. *Examples:*

- Bread, fruit, nuts, biscuits, sip feeds, and ready-to-use therapeutic food or ready-to-use supplementary food, if appropriate.

## Fluids

Proper hydration is essential in the care of EVD. The recommendations below offer a complementary nutritional perspective to the guidance provided on this by WHO.

Various approaches for facilitating hydration have been described in relation to EVD:

- Offer oral rehydration solution (ORS) or water with each meal/snack,<sup>5</sup> and ensure it is always freely and abundantly available.
- Optimize the intake of fluids by actively encouraging frequent sips. Greater support should be given to those who are more ill.<sup>1</sup>
- If nausea or vomiting impedes fluid intake, consider an antiemetic medication such as ondansetron.<sup>1</sup>
- Provide flavoured ORS or mix in some fruit juice to increase palatability.<sup>1,14</sup>
- Use coconut water or “jelly water” (coconut milk from a young coconut) to increase intake of fluid and potassium.<sup>1,3</sup>
- In warm climates, offering cold water (rather than room temperature water) may facilitate intake.

The use of sweetened carbonated beverages or juices in patients with diarrhoea has been controversial because of the high osmolarity and low nutritional value of these products; caution is therefore needed, as high consumption of these beverages can exacerbate the diarrhoea.<sup>2</sup> Further, these products are low in electrolytes and nearly all essential nutrients.

Despite their drawbacks, ETU health workers have argued that carbonated drinks have been useful in increasing/maintaining fluid intake. Patients frequently request them, and they have been reported to “cheer people up”.<sup>3</sup> The current consensus is that sweetened carbonated beverages should be avoided, except as a short-term solution if a patient refuses all other drinks offered. Non-sweetened, non-caffeinated carbonated beverages (e.g., sparkling water) may be permitted.

**NOTE:** Please refer to medical protocols for guidance regarding **rehydration**, including volumes of ORS to provide and when to use intravenous fluids.

## Additional considerations when selecting foods/liquids and planning meals

Viable food commodities and meals should:<sup>2,6,15</sup>

- Be easy to ingest
- Require minimal assistance to eat
- Require minimal use of utensils
- Have limited risk of bacterial contamination
- Be able to be kept at the bedside for 2–3 hours without spoiling
- Be accessible and available
- Have limited non-soluble fibre content
- Be easy to prepare

**NutVal** is a free access tool for meal planning using a wide range of available foods. It can be found here: <https://www.nutval.net>.

## ANNEXES

### Annex 1. Weekly menu examples for solid and semi-solid diets (must be properly adapted and blended for semi-solid diet)

*Example 1:*<sup>11</sup>

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
<b>Breakfast</b>	Cream of wheat, sausage, sweet bread, banana, fruit juice	Cream of wheat, egg, banana, fruit juice	Corn meal, yogurt, sweet bread, banana, fruit juice	Oats cream, boiled egg, sweet bread, banana, fruit juice	Corn meal, egg, yogurt, banana, fruit juice	Cream of wheat, yogurt, banana, fruit juice	Corn meal, egg, yogurt, banana, fruit juice
<b>Lunch</b>	Vegetable stew, rice + animal-based protein*	Potato greens, rice + animal-based protein*	Vegetables beans, rice	Cassava leaves, rice + animal-based protein*	Vegetables, rice + animal-based protein*	Vegetable soup, fufu + animal-based protein*	Potato greens, rice + animal-based protein*
<b>Dinner</b>	Irish potato soup, fruit juice	Eddoes soup, fruit juice	Plantain soup, fruit juice	Potato soup, fruit juice	Yam and plantain soup, fruit juice	Plantain soup (+ green bean and carrots), fruit juice	Eddoes soup, fruit juice

\* e.g., beef, goat, chicken, fish, egg

**Example 2:<sup>7</sup>**

	<b>Breakfast* (7:30-8:30 am)</b>	<b>Mid-morning** (11:00-11:30 am)</b>	<b>Lunch (1:00-2:30 pm)</b>	<b>Dinner (6:00-7:00 pm)</b>
<b>Sunday</b>	Bread & butter Sardines Rice pap	Boiled cassava Meat soup	Fried rice Vegetables Chicken	Pasta with meat sauce
<b>Monday</b>	Bread & butter Lunch meat Ogi pap	Pancake Chicken and gravy	Rice Cassava leaves Meat or smoked fish	Boiled rice Fish soup
<b>Tuesday</b>	Bread & butter Boiled egg Rice pap	Boiled cassava Fish soup	Jollof rice Vegetable and chicken stew	Pancake Fried fish and gravy
<b>Wednesday</b>	Bread & butter Sardines Ogi pap	Pasta and chicken Soup	Rice Crain-Crain Meat or smoked fish	Boiled rice Meat soup
<b>Thursday</b>	Bread & butter Lunch meat Rice pap	Boiled cassava Meat soup	Rice Potato leaves Meat or smoked fish	Rice Chicken soup
<b>Friday</b>	Bread & butter Boiled egg Ogi pap	Pancake with Chicken Gravy	Checked rice Groundnut soup Chicken	Pasta or rice Meat stew
<b>Saturday</b>	Bread & butter Cheese Rice pap	Sweet potato and fish soup	Rice Green leaves Meat or smoked fish	Rice Chicken soup

\* Tea served daily with breakfast \*\* Optional snack for patients with strong appetite



**Annex 2. Examples of breakfast, lunch and dinner recipes for solid and semi-solid diets (must be properly adapted and blended for semi-solid diet)<sup>11</sup>**

**Breakfast**

	<b>Food items</b>	<b>Amount/person</b>
<b>Corn meal and boiled egg</b>	Corn meal Oil Sugar Milk powder Egg	150 g 10 g 10 g 5 g 50 g (1 egg)
<b>Corn meal, sausage and yoghurt</b>	Corn meal Oil Sugar Milk powder Sausage (only for solid diet) Yoghurt	150 g 10 g 10 g 5 g 30 g 100 g
<b>Oat porridge and yoghurt</b>	Oats Oil Sugar Milk powder Yoghurt	150 g 10 g 10 g 5 g 100 g
<b>Cream of wheat and boiled egg</b>	Wheat flour Oil Sugar Milk powder Egg	150 g 10 g 10 g 5 g 50 g (1 egg)
<b>Cream of wheat and sausage</b>	Wheat flour Oil Sugar Milk powder Sausage (only for solid diet)	150 g 10 g 10 g 5 g 30 g
+ 1 piece of sweet bread (solid diet only) + 1 banana + fruit juice		

### Lunch

	Food items	Amount/person
<b>Vegetable stew</b>	Rice Oil Chicken* Fish** Vegetables Onion Salt	200 g 20 g 70 g 40 g 90 g 10 g 1g
<b>Kidney beans and rice</b>  *** Soak overnight and cook for a long time until very soft.	Rice Oil Kidney beans*** Chicken* Vegetables Onion Salt	200 g 20 g 60 g 60 g 90 g 10 g 1 g
<b>Vegetable rice</b>	Rice Oil Chicken* Vegetables Onion Soy sauce Salt	200 g 20 g 110 g 90 g 10 g To taste 1 g
<b>Potato greens</b>	Rice Oil Chicken* Fish** Green leaves (include some carrots) Onion Salt	200 g 20 g 70 g 40 g 90 g 10 g 1 g
<b>Cassava leaves</b>	Rice Oil Chicken* Fish** Cassava leaves Onion Ground nuts Salt	200 g 20 g 70 g 35 g 80 g 10 g To taste/per local tradition 1 g
<b>Fufu and soup</b>	Fufu Oil Chicken* Fish** Green leaves (include some carrots) Salt	175 g 20 g 70 g 40 g 90 g 1 g

\* Weights provided are for whole fish, although it should be served without bones (edible portion of 40 g fish is around 35 g) \*\* Weights provided are for whole chicken, although it should be served without bones (edible portion is only about 65 per cent)<sup>11</sup>

**Dinner**

	<b>Food items</b>	<b>Amount/person</b>
<b>Potato soup</b>	Potatoes Oil Chicken* Onion Benny seeds Salt	250 g 10 g 20 g 10 g Trace 1g
<b>Plantain soup (with green beans and carrots when no vegetables in lunch)</b>	Plantain Oil Dry fish (boneless) Peanut paste Onion Salt	250 g 10 g 15 g 10 g 10 g 1 g
<b>Eddoes soup</b>	Eddoes Oil Dry fish (boneless) Benny seeds Salt	250 g 10 g 15 g Trace 1 g
<b>Yam, plantain and sweet potato soup</b>	Yams Plantains Sweet potatoes Oil Chicken* Onion Salt	60 g 70 g 120 g 10 g 20 g 10 g 1 g

\* Weights provided are for whole chicken, although it should be served without bones (edible portion is only about 65 per cent)<sup>11</sup>

## References

1. World Health Organization. Clinical Management of Patients with Viral Haemorrhagic Fever: A Pocket Guide for Front-Line Health Workers: Interim Emergency Guidance for Country Adaptation. World Health Organization; 2016.
2. World Health Organization, World Food Programme, United Nations Children's Fund (UNICEF). Interim Guideline: Nutritional Care of Children and Adults with Ebola Virus Disease in Treatment Centres. World Health Organization; 2014.
3. Ververs M, Anantharam P. Nutritional Care For Patients With Ebola Virus Disease In Ebola Treatment Units: Past And Current Experiences. US Dep Health Hum Serv Cent Dis Control Prev. Published online August 26, 2019:28.
4. République Démocratique du Congo, Ministère de la Santé, Programme National de Nutrition (PRONANUT), with support from UNICEF. Protocole de Soins Nutritionnels Chez Le Adultes et Les Enfants Avec Maladie a Virus Ebola (MVE) Hospitalisés Aux Centres de Traitement (CTE).; 2018.
5. International Committee of the Red Cross (ICRC). Nutrition Care Protocols for Ebola Virus Disease (EVD) Patients - Liberia Experience. Draft version 9.; 2015.
6. Ministry of Health and Social Welfare, Republic of Liberia. Guidelines on Nutritional Care and Support for EVD Patients in Treatment Units and Care Centers - A Practical Guide for Implementing Agencies Involved in the Management and Treatment of EVD in Liberia.; 2014.
7. GOAL. International Package of Tools and Protocols for Ebola Treatment Units.; 2014.
8. République Démocratique du Congo, Ministère de la Santé, Programme National de Nutrition (PRONANUT), with support from UNICEF. Protocole de Soins Nutritionnels Dans Le Context de La Maladie a Virus Ebola and Republique Democratique Du Congo.; 2019.
9. Yam D, Aluisio AR, Perera SM, et al. Association between multivitamin supplementation and mortality among patients with Ebola virus disease: An international multisite cohort study. Afr J Emerg Med Rev Afr Med Urgence. 2020;10(1):23-29. doi:10.1016/j.afjem.2019.11.001
10. Aluisio AR, Perera SM, Yam D, et al. Vitamin A Supplementation Was Associated with Reduced Mortality in Patients with Ebola Virus Disease during the West African Outbreak. J Nutr. 2019;149(10):1757-1765. doi:10.1093/jn/nxz142
11. International Committee of the Red Cross (ICRC), Médecins Sans Frontières (MSF OCB/OCG). Nutritional Protocol for Patients Infected with Ebola Virus Disease. v 3.; 2016.
12. République Démocratique du Congo, Ministère de la Santé, Programme National de Nutrition (PRONANUT), with support from UNICEF. Manuel d'Orientation Sur La Promotion, La Protection et Le Soutien a l'Alimentation Du Nourisson et Du Jeune Enfant En Communauté Dans Le Context de l'Epidémie de La Maladie a Virus Ebola a l'Est de La Republique Democratique Du Congo.; 2019.
13. Médecins Sans Frontières (MSF). 2018 Filovirus Disease Guidelines - Draft, Appendix X: Nutritional Tools for Patients Infected with Filovirus Disease.; 2018.
14. World Health Organization. Optimized Supportive Care for Ebola Virus Disease: Clinical Management Standard Operating Procedures. World Health Organization; 2019.
15. Save the Children. ETC Nutrition Protocol - Kerry Town Ebola Treatment Centre. V2 ed.; 2015.

### **FAQ Patient Care 3. How should infant and young child feeding (including breastfeeding) be managed in Ebola Treatment Units (ETUs)?**

- Young children require special attention in ETUs. They are generally at increased risk of malnutrition upon admission, and due to poor nutritional reserves, they are at increased risk of developing acute malnutrition during illness.
- If they are breastfed, there is a possibility that breastfeeding will need to be stopped abruptly without time for proper weaning.
- They also may be separated from caregivers, with major emotional consequences, including decreased appetite.
- Even if not acutely ill, many young children require physical feeding support.

These factors put young children at particular nutritional vulnerability.

This FAQ covers three main topics to be considered in the context of EVD and the management of ETUs:

- 1. Breastfeeding**
- 2. Replacement feeding with a breastmilk substitute (BMS)**
- 3. Complementary feeding**

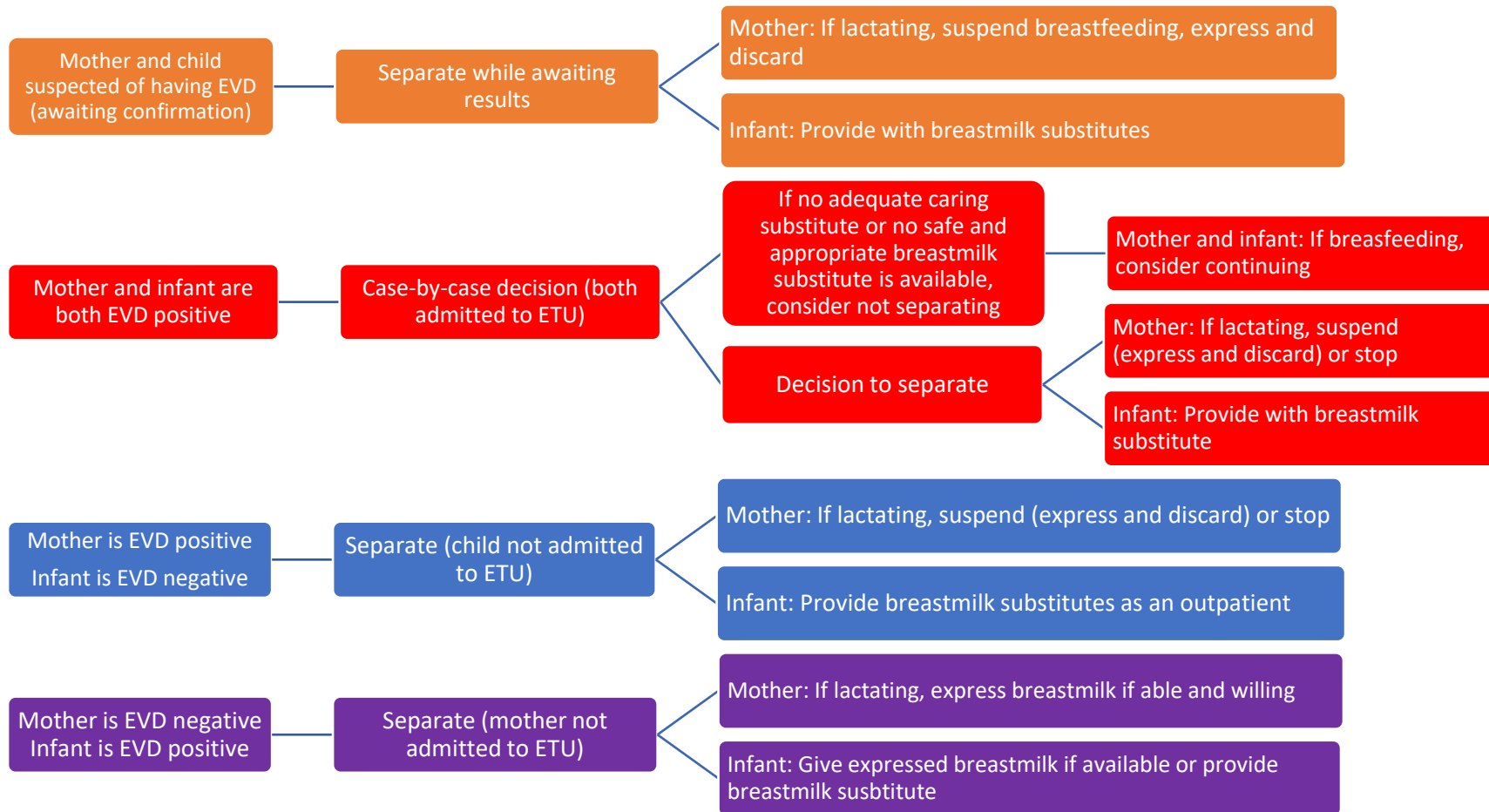
More detailed guidance on these three topics for non-EVD contexts is provided elsewhere.

#### **1. BREASTFEEDING**

***What are the current recommendations regarding breastfeeding and the management of mothers and children <24 months of age in ETUs?***

ETU management of mothers and children <24 months of age depends on the Ebola virus status of each<sup>1,2</sup>. See Figure 1 and associated descriptions below.

**Figure 1. Decision tree for mother-child pairs in an ETU**



### **If mother and child are admitted to the ETU and awaiting their test results:**

- When mother-child pairs are admitted to an ETU and diagnosis for EVD has not yet been confirmed, they should be separated while awaiting RT-PCR<sup>c</sup> test results.
- If the mother is lactating, breastfeeding should be immediately suspended. Breastmilk should be expressed and discarded (treated as hazardous waste) so that milk supply can be maintained and breastfeeding can be easily resumed if/when it is appropriate.
- Children <24 months who were previously breastfed or receiving other milks should be provided with a BMS.

### **If mother and child are admitted to the ETU and both test positive for EVD:**

- The appropriateness of separating EVD positive mother-child pairs where both are EVD-positive should be evaluated on a case-by-case basis. Age of the child, disease severity and other contextual factors must be considered, while recognizing the nutritional and immunological benefits of breastmilk.
- According to WHO guidance: if a child is <6 months of age and does not have access to safe and appropriate BMS, or the child cannot be adequately cared for, then the option to not separate and continue breastfeeding can be considered<sup>2</sup>.
- Guidance suggesting to discontinue breastfeeding in the event that both a breastfeeding woman and her breastfed child have acute EVD are based on “a hypothetical risk of viral ‘boosting’ between two infected individuals. Viral boosting could in theory increase disease severity through additional viremic exposure.” (ibid)<sup>d</sup>
- Regardless of the context, a mother’s choice should be respected and supported by healthcare workers without stigmatization and with clear individual counselling. There is a high level of uncertainty around the risks of continued breastfeeding when both mother and child are positive, which should be conveyed to the mother during counselling.<sup>3</sup>
- In the event that a mother who has decided to continue breastfeeding becomes too ill to do so, then BMS may nevertheless be required.
- When lactating mothers suspend or stop breastfeeding, any expressed breastmilk should be discarded.

### **If only the mother is EVD positive and admitted to ETU:**

- Only the mother should remain in the ETU.
- Lactating mothers should suspend or stop breastfeeding. Any expressed breastmilk should be discarded.

### **If only the child is EVD positive and admitted to the ETU:**

---

<sup>c</sup> Reverse transcription polymerase chain reaction test

<sup>d</sup> Evidence to directly support this theory is lacking and indeed the WHO recommendation to discontinue breastfeeding is based on “very low quality of evidence

- Only the child should remain in the ETU.
- Lactating mothers should be encouraged to express breastmilk, which can be provided to the admitted child as long as appropriate infection prevention and control measures are in place.
- Assistance should be provided in expressing breastmilk, and if possible, a manual breast pump should be supplied. (Note: expressed milk must be refrigerated and discarded after one day in refrigerator or one hour at bedside).
- If the mother is unable to supply expressed breastmilk, the child should be provided with BMS.

### ***What support should be offered to women in ETUs who suspend or stop breastfeeding?***

- Upon arrival at the ETU (whether for suspected or confirmed EVD), lactating women should be provided with a specific consultation on breastfeeding. Efforts should be made to protect, promote and support future breastfeeding.
- Lactating women intending to resume breastfeeding when it is safe and appropriate should be supported to retain breastmilk production. They should be taught to express breast milk regularly, either manually or with a breast pump.
- Lactating women wishing to stop breastfeeding should be offered assistance on expressing breastmilk in order to alleviate pain and engorgement and prevent inflammation.
- If appropriate and available, medication such as Cabergoline should be considered and offered to pregnant or breastfeeding women to suppress lactation. In a pregnant woman, this is ideally offered soon after delivery/pregnancy termination.

Note: Expressed breastmilk from an EVD patient should be considered a contaminated product and be handled following Ebola infection prevention and control guidelines to reduce risk of virus transmission<sup>3</sup>.

### ***What are breastfeeding recommendations for lactating women discharged from ETUs as cured?***

- Lactating women who have stopped breastfeeding and are discharged as cured of EVD and have a young child who is asymptomatic or EVD negative should not resume breastfeeding until there have been two negative breastmilk RT-PCR tests (separated by 24 hours).
- Breastmilk should be tested immediately prior to or upon discharge from the ETU. Likewise, all lactating women who had EVD while pregnant should have their breastmilk tested for Ebola virus by RT-PCR. If Ebola virus RNA is detected, breastmilk should be retested every 48 hours until two consecutive “undetected” results are obtained.
- If a lactating woman is discharged cured of EVD and unable to test her breastmilk, she should not resume breastfeeding as the risk of transmission to the infant can remain for some time after clinical recovery in some cases<sup>2</sup>.



## 2. REPLACEMENT FEEDING WITH BMS

### What should be used as a BMS?

#### For infants <6 months old:

- Ready-to-use infant formula (RUIF) is the first choice of BMS for this age group in an ETU<sup>e</sup>. No other food/drink should be provided except oral fluids (e.g., oral rehydration solution) prescribed by the clinician.
- If RUIF is not available, powdered infant formula (PIF) appropriate for infants <6 months of age is the second choice.

#### For children 6–23 months old:

- PIF, RUIF or UHT whole milk (ultra-high temperature full cream milk) can be used. The choice may depend on what is available and feasible to give.

*RUIF or reconstituted PIF must be used within two hours after opening and discarded thereafter. Once a carton of UHT milk has been opened, it should be used or discarded within two hours if left at room temperature. Refrigerated contents should be used within seven days of opening.*

#### Therapeutic milks: F-75 and F-100

These milks should be prioritized for the treatment of with severe acute malnutrition in children 6–59 months of age. If no other BMS are available for non-malnourished children, F-100 can temporarily be used until an appropriate BMS is made available.

**NOTE:** In most contexts, wet nursing is not recommended as the risk of Ebola virus transmission from a wet-nurse to an infant and vice versa is considered high if either becomes infected.<sup>3</sup>

### What quantity of BMS should be provided and how often?

The amount of milk to give and frequency of feedings will depend on the child’s age. The amount given to children aged 6–23 months also depends on the ability to consume a semi-solid or solid diet. Those on a liquid diet should only receive milk, while those on a semi-solid or solid diet should also receive complementary foods. See tables below.

**Table 1. Recommended amount of BMS for infants <6 months of age**

Age	Total amount daily	Number of feeds per day	Amount per feed
<1 month	450 ml	8	60 ml
1 month	600 ml	7	90 ml
2–3 months	750 ml	6	120 ml
4–5 months	900 ml	6	150 ml

<sup>e</sup>RUIF is infant formula that does not need further preparation and is ready to use; its supply does have considerable cost and storage implications, which needs careful consideration in every context.

**Table 2. Recommended amount of BMS for children 6–23 months of age**

Age	Total amount daily	Number of feeds per day	Amount per feed
<b>Milk + complementary foods</b> (semi-solid or solid diet)			
6–23 months	500 ml	5	100 ml

BMS should be given using a disposable or sanitized cup. If an infant (<1 year old) has difficulty with a normal cup, the first choice would be a specially designed feeding cup (paladai).<sup>f</sup> If not available, a syringe can be used and must be replaced for each feeding.

**Replacement feeding needs on discharge and follow-up**

Considering the length of time it takes for breastmilk to test negative for EVD (median reported to date is 36 days post ETU discharge), ETUs should consider supplying families in need of replacement feeding a two-month supply of an appropriate BMS and linking them to services that can assess and support further infant feeding decisions after this time. The feasibility and acceptability of providing this discharge ration of BMS should be assessed for each ETU and their associated health system and support. As ever, giving out BMS must always be accompanied with appropriate education on how to safely prepare, give and store it at home.

**3. COMPLEMENTARY FEEDING**

In addition to milk, children 6–23 months of age should be offered nutritionally complete and varied meals that are appropriate for their development. Consistency should increase gradually depending on the child’s age, overall health and ability to eat. Mash, puree and soften food for younger infants to make it easier for them to chew and swallow. For older children, cut solid food up into very small pieces to avoid choking.

**Frequency of meals depends on age:**

- 6–8 months old: Give 2–3 meals and 1–2 snacks per day.
- 9–23 months old: Give 3–4 meals and 1–2 snacks per day.

If the child lacks appetite, meal/snack size should be decreased, and frequency should be increased. Ensure there are nighttime feeding options.

Each meal should include 2 to 3 different family foods from the following groups, with all groups being covered each day:

- Staple foods: grains, roots, tubers.
- Foods of animal source: meat, chicken, fish, liver, eggs and dairy products.
- Legumes: beans, lentils, peas and seeds. (Soak beans and legumes prior to cooking to make them softer and more suitable for children to consume).

<sup>f</sup> For information on paladai cups: <https://shop.laerdalglobalhealth.com/product/nifty/>

- Fruits and vegetables (especially those rich in vitamin A): papaya, mango, passion fruit, oranges, dark green leafy vegetables, carrots, pumpkin and sweet potatoes.

Younger children may need foods that are prepared especially for them, while older children can generally eat the same food items that are provided to older children and adults, just in smaller quantities and with the appropriate consistency.

Snacks can include fruit, bread or other simple, traditional (healthy) foods.

Diets that are assessed as not meeting daily micronutrient needs should be supplemented with micronutrient powder. As with older patients, local foods should be the first choice.

Ready-to-use therapeutic food or ready-to-use supplementary food should be reserved for children with severe (RUTF) or moderate (RUSF) acute malnutrition. However, if no other appropriate snacks or supplements are available for non-malnourished children, these products can be used as supplements if necessary and if the child accepts them. RUTF in bar or biscuit form should be made into porridge. Paste versions of RUTF/RUSF are not appropriate for those with swallowing difficulties.<sup>1</sup>

Avoid offering processed fruit juices, sodas or other non-nutritive beverages as they may exacerbate diarrhoea and are low in nutrients.

## References

1. République Démocratique du Congo, Ministère de la Santé, Programme National de Nutrition (PRONANUT), with support from UNICEF. Manuel d'Orientation Sur La Promotion, La Protection et Le Soutien à l'Alimentation Du Nourisson et Du Jeune Enfant En Communauté Dans Le Contexte de l'Epidémie de La Maladie à Virus Ebola à l'Est de La République Démocratique Du Congo.; 2019.
2. World Health Organization. Guidelines for the Management of Pregnant and Breastfeeding Women in the Context of Ebola Virus Disease. World Health Organization; 2020.
3. World Health Organization. Clinical Management of Patients with Viral Haemorrhagic Fever: A Pocket Guide for Front-Line Health Workers: Interim Emergency Guidance for Country Adaptation. World Health Organization; 2016.

## FAQ Patient Care 4. When and how should specialized nutrition products be used in Ebola Treatment Units (ETUs)?

ETU diets should consist primarily of local/traditional foods, regardless of required consistency (i.e., soft, semi-solid, solid). Experience has shown that most patients in ETUs, especially adults, do not like to consume specialized nutrition products (see Table 1), regardless of their state of disease. Specialized nutrition products can have a role in specific situations, but their use should be determined by individual patient needs and food preferences.<sup>1</sup>

Specialized nutrition products are essential for the treatment of acute malnutrition. They may also be useful in providing nutritional supplementation when full nutritional support can not be accomplished via local/traditional foods. Finally, specialized nutrition products may be required in exceptional circumstances, such as while an ETU is being set up or when regular meal provision through catering or on-site preparation is unavailable.

When using specialized nutrition products, attention should be made to optimize their acceptability among patients. Some adults find the taste of RUTF paste too sweet and a diet with specialized nutrition products is often regarded as monotonous and lacking palatability. This results in patients not consuming the supplied food. Not only are the nutritional needs of patients not being met in this case, but unconsumed food can also create significant wastage and an ensuing health hazard in the red zone.

**Table 1** summarizes the different nutrition products that can be used in an ETU as well as the specific populations and situations in which their use may be warranted.

**Table 1: Special nutrition products for use in ETUs**

Product category	Therapeutic milk		Ready-to-use therapeutic food (RUTF)		Ready-to-use supplementary food (RUSF)	Fortified blended flour		High energy drinks**	Enteral feeding products**	Micronutrient supplement
	F-75	F-100	Paste form (e.g., Plumpy'Nut and eeZeePaste)	Biscuit form (e.g., BP100)	Paste form (e.g., Plumpy'Sup, eeZeeRUSF)	Super Cereal	Super Cereal Plus	"sip feeds" (e.g., Ensure, Nutricomp, Peptamen, Nutricia)	(e.g., Sondalis)	Multiple micronutrient powder
<b>Type of diet</b>	Enteral feeding or liquid diet		Semi-solid or solid diets		Semi-solid or solid diets	Semi-solid or solid diets		Liquid diet	Enteral feeding	Semi-solid or solid diets
<b>Essential use in ETUs (1<sup>st</sup> choice)</b>	6–59 months: Treatment for severe acute malnutrition with complications, acutely ill, or no appetite	6–59 months: Treatment for severe acute malnutrition with poor appetite	6–59 months: Treatment for severe acute malnutrition with intact appetite	6–59 months: Treatment for severe acute malnutrition with intact appetite	6–59 months: Nutritional supplement for moderate acute malnutrition		6–59 months: Nutritional supplement for moderate acute malnutrition	≥6 months: Meal replacement or nutritional support	≥6 months: Meal replacement	
<b>Optional use in ETUs*</b>		6–59 months: Meal replacement (if enteral feeding products or high energy drinks unavailable)	≥5 years: Treatment of severe acute malnutrition with intact appetite	>5 years: Treatment of severe acute malnutrition with intact appetite		≥6 months: Nutritional support	6–23 months and pregnant and lactating women: Nutritional support			≥6 months: Micronutrient supplementation

\* If first choice not available and/or insufficient local food options.

\*\*Age-specific formulations are available and must be considered.

### **Therapeutic milk**

F-75 and F-100 are therapeutic milk products formulated for the treatment of severe acute malnutrition among children 6–59 months of age. See national nutrition protocols for the management of acute malnutrition for direction on how to use these milks. Therapeutic milks are packaged as powder and require reconstitution with potable water. They can be given orally using a disposable cup or syringe, or via an enteral tube.

Although not an official indication, F-100 may also be used among non-malnourished children requiring enteral feeding or a liquid diet if enteral feeding products are not available or feasible to be used.

Therapeutic milk is not generally recommended for adults with EVD, regardless of nutritional status, as they were designed to meet the needs of children with severe acute malnutrition. There may also be concerns related to lactose-intolerance<sup>1,2</sup> and poor acceptability.

If a patient with diarrhoea receives oral rehydration solution while also receiving F-75 or F-100, do not administer zinc, as therapeutic milk products contain a sufficient quantity of zinc.<sup>3</sup>

*Therapeutic milk should be consumed within two hours after preparation, and preferably immediately.*

### **Ready-to-use therapeutic food (RUTF)**

RUTF was developed for the treatment of severe acute malnutrition. This should be its primary use, even in ETUs. Refer to national protocols for the management of acute malnutrition for further details regarding use of RUTF among children with acute malnutrition.

RUTF may also be used in ETUs for providing nutritional support among non-malnourished patients when nutritional requirements can not be met through local/traditional food. In this case, RUTF should only be used as a last resort.

RUTF can be consumed straight from the package or mixed with water and made into a porridge or drink (see below for instructions and details), as per the patient's dietary needs and preferences. Patients should be encouraged to drink plenty of water with RUTF

RUTF can be used as a nutritional supplement for meals or snacks, if there are no other appropriate local alternatives. Though it can be used as a meal replacement, acceptance when used as such is generally low among adults. It is best consumed alongside other foods or mixed with them.

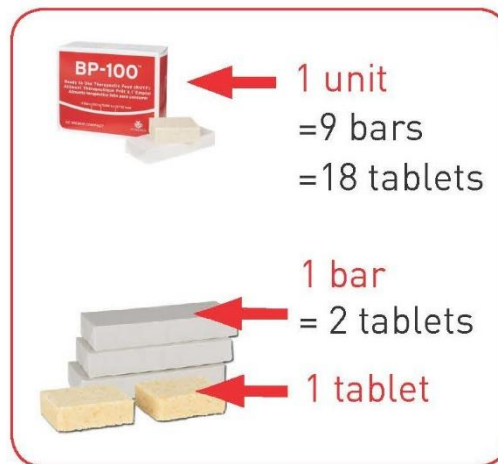
#### RUTF in biscuit form (e.g., BP-100)

Each 57 g biscuit/bar has 300 kcal (a bar is made up of two tablets). They can be eaten directly from the package or mixed with water and eaten as a porridge. Adults often prefer the biscuit over the paste form of RUTF.

Only patients tolerating a solid diet should be given biscuit/bars for direct consumption from the package.

A porridge can be made by combining six tablespoons of boiled potable water for each biscuit/bar (see Annex 1). This porridge can be given to patients tolerating a semi-solid or solid diet. Consider adapting the mixture according to local preferences to render it more palatable.

*Porridge should be eaten within two hours of preparation, and ideally immediately.*<sup>3</sup>



#### RUTF in paste form (e.g., Plumpy' nut® and eeZeePaste™)

Each sachet contains 500 kcal. The contents are generally consumed straight from the sachet.

As RUTF paste is softer than the bars, it can be consumed straight from the sachet by patients tolerating either semi-solid or solid diets. It must not be given to patients with difficulty swallowing.

RUTF paste can be diluted with water for consumption by patients on a liquid diet or with difficulty swallowing (or for children who refuse it straight from the sachet). To do this, dilute one sachet in about 500 ml of water; squeeze contents into a small water bottle; and add warm (not boiling) water and shake vigorously.<sup>5,6</sup>

*Once opened, RUTF in paste form should be discarded within 12 hours<sup>2</sup> if still in the original packaging and within three hours if outside the original packaging. Packaging must be sealed (e.g., with a clip and stored in an air-tight container/bag).*

### **Ready-to-use supplementary food (RUSF)**

RUSF (e.g., Plumpy'Sup®, eeZeeRUSF™) was developed for nutritional supplementation of children with moderate acute malnutrition. This should be its primary use, even in ETUs. Refer to national protocols for the management of acute malnutrition for further details regarding use of RUSF.

As with RUTF, RUSF may also be used in ETUs for providing nutritional support among non-malnourished patients when nutritional requirements cannot be met through local/traditional food. In this case, RUSF should only be used as a last resort. RUSF can be used as a meal replacement or a snack, and consumed alone or alongside other food.

RUSF is generally only available in paste form. It is very similar to RUTF paste, with the principle difference being the type of protein contained in each. See above under 'RUTF in paste form' for details regarding use.

The choice whether to use RUSF or RUTF for non-malnourished patients will likely be influenced by product availability as well as patient preference (as only RUTF is available in biscuit form).

RUSF cannot be used to treat severe acute malnutrition.

*Once opened, RUTF in paste form should be discarded within 12 hours<sup>2</sup> if still in the original packaging, and within three hours if outside the original packaging. Packaging must be sealed (e.g., with a clip and stored in an air-tight container/bag)*

### **Fortified blended foods (FBFs)**

#### **Super Cereal**

Super Cereal, also known as Corn-Soya Blend Plus (CSB+), is a mixture of corn/wheat flour, whole soya beans, sugar, vegetable oil, vitamins and minerals. It is formulated for use as nutritional support for adults and children ≥6 months of age and provides 380 kcal/100 g of dry product. It should be consumed as a porridge, prepared with the ratio of 40 g of super cereal per 250 g of potable water (cooked at simmering point for 5–10 minutes).

Super Cereal can be used in ETUs for providing nutritional support when nutritional requirements cannot be met through local/traditional food. It is recommended for patients that are prescribed a semi-solid and solid diet.<sup>3</sup> The product can be used as a complete meal or (preferably) alongside local foods.

Field experience with EVD patients has shown increased acceptance of Super Cereal when made into locally adapted porridge. Recipes can be developed that use local ingredients and align with local preferences. For example, a recipe used in Liberia adds sugar, lemon juice, milk, mashed banana or other local fruit to the standard preparation.<sup>1,5</sup> Coconut shavings can also be added to improve flavour and acceptability.

(NOTE: Adding milk is not recommended for adults with (temporary) lactose intolerance).<sup>7</sup>

*Super Cereal should be consumed within two hours of preparation, and preferably immediately.<sup>3</sup>*



### **Super Cereal Plus**

Super Cereal Plus, also known as Corn-Soya Blend Plus (CSB++), is similar to Super Cereal, with added milk powder. It is formulated for use as supplementary food for children 6–59 months of age with moderate acute malnutrition and the preferred fortified blended food to be used for nutritional support among children 6–23 months of age and pregnant and lactating women. It provides 410 kcal/100 g of dry product. It should be consumed as a porridge, prepared with the ratio of 50 g of super cereal for 250 g of potable water (cooked at simmering point for 5-10 minutes).

Its preparation is otherwise identical to the recommendations presented above for Super Cereal.

### **High energy drinks (“sip feeds”)**

Sip feeds are ready-to-use hypercaloric liquid nutrition, formulated to meet the nutritional requirements necessary for prevention or treatment of disease related malnutrition. They are nutritionally complete and can thus be used as a sole source of nutrition or as supplemental nutrition support. They are also lactose-free, so they are particularly appropriate for patients with high-output diarrhoea. They often come in individual portions (200 ml) and are thus both hygienic and easy to ingest. High energy drinks can be consumed orally by any patient able to swallow or be given via nasogastric tube.

Two forms of high energy drinks available:<sup>7</sup> hypercaloric with normal protein and hypercaloric with high protein. The normal protein formulation will be the best option for most ETU patients.

Sip feeds can be used in ETUs for patients who are unable to meet their nutritional requirements through local/traditional food. They are a particularly important option for patients in critical care and/or on liquid diets. In this case, they can be used as meal replacement or alongside other liquid food. If necessary, sip foods may also be used as a supplement for patients tolerating semi-solid or solid diets; they should not however be the first choice.

Though costly, sip feeds are preferable to therapeutic milks for adult patients. They are specially formulated for adult patients with high energy requirements, they do not require preparation, and they may be better accepted by patients.

High energy drinks can also be used in nasogastric tube feeding if enteral feeding products are not available.

Adult and paediatric versions are widely available in the international market. However, considering cost and local availability, other options might be preferred over high energy drinks for paediatric use.

*High energy drinks should be consumed within 3 hours of opening if kept at room temperature.<sup>7</sup> Any non-consumed product should be refrigerated and discarded after 24 hours.<sup>8</sup>*

Note: These products have not yet been tested in ETUs. Reasons for this include lack of availability in organization supply catalogs, unfamiliarity with product, the need for substantial lead time for ordering and receipt, customs issues, the expense of the product, and its limited shelf life.

### ***Enteral feeding products***

When a nasogastric tube is selected as the preferred method for feeding a patient, specialized nutrition products are preferred over local/traditional foods. As the enteral food will serve as a meal replacement, it is important to provide all essential nutrients through the liquid food. Using local foods (e.g., porridges) can result in inadequate patient nutrition as well as osmotic and electrolytic abnormalities. Furthermore, food that is too thick can easily lead to tube blockage, exacerbating the risks associated with nasogastric tube feeding.

Various commercial products are available on the market. The choice of which to use in a specific ETU should be made in collaboration with the medical team and based on product availability. Age-specific formulations should be considered.

### ***Multiple micronutrient powders (MNPs)***

MNPs are a mixture of vitamins and minerals packaged as single-dose sachets, to be stirred into a food portion immediately before consumption.<sup>9</sup> They can be added to food without modifying taste or texture. WHO recommends enriching ETU meals with MNPs when fortified or specialized food products are not given, and when the local food served in the ETU may not meet the nutrient requirements of the patient.<sup>10</sup>

To ensure appropriate food consistency, MNP powder should be added to meals just prior to being served (one sachet per day, per patient) when the food is still warm but not at boiling temperature (i.e., just before meals are taken into the red zone). Alternatively, individual sachets can be provided at the patient's bedside and added by the support staff. Whenever possible, patients should be informed about MNPs and their benefit and consent to consuming them.

## ANNEXES

### Annex 1. Recipe for BP100 porridge<sup>3</sup>

**Ingredients:**

- 3 dl of water (= 6 spoons) \*
- 1 bar of BP100

**Porridge preparation:**

1. Bring drinking to boil then remove from heat and let it cool.
2. Crush up the BP100 bar.
3. When the water is lukewarm, add the crushed bar.
4. Stir until smooth, being sure to avoid the formation of clumps.

\* If the patient has difficulty swallowing or has anorexia, more water can be added to the BP100.

## References

1. Ververs M, Anantharam P. Nutritional Care For Patients With Ebola Virus Disease In Ebola Treatment Units: Past And Current Experiences. *US Dep Health Hum Serv Cent Dis Control Prev*. Published online August 26, 2019:28.
2. World Health Organization, World Food Programme, United Nations Children's Fund (UNICEF). *Interim Guideline: Nutritional Care of Children and Adults with Ebola Virus Disease in Treatment Centres*. World Health Organization; 2014.
3. Ministry of Health and Social Welfare, Republic of Liberia. *Guidelines on Nutritional Care and Support for EVD Patients in Treatment Units and Care Centers - A Practical Guide for Implementing Agencies Involved in the Management and Treatment of EVD in Liberia.*; 2014.
4. International Committee of the Red Cross (ICRC), Médecins Sans Frontières (MSF OCB/OCG). *Nutritional Protocol for Patients Infected with Ebola Virus Disease*. v 3.; 2016.
5. International Committee of the Red Cross (ICRC). *Nutrition Care Protocols for Ebola Virus Disease (EVD) Patients - Liberia Experience*. Draft version 9.; 2015.
6. International Medical Corps (IMC). *Nutrition Guidelines for Ebola Treatment Centers.*; 2014.
7. Médecins Sans Frontières (MSF). *2018 Filovirus Disease Guidelines - Draft, Appendix X: Nutritional Tools for Patients Infected with Filovirus Disease.*; 2018.
8. Ensure\_TwoCal\_datasheet\_226KB.pdf. Accessed November 30, 2022. [https://static-nocdn.abbottnutrition.com/cms/preview/abbottnutrition-2016.com/img/Ensure\\_TwoCal\\_datasheet\\_226KB.pdf](https://static-nocdn.abbottnutrition.com/cms/preview/abbottnutrition-2016.com/img/Ensure_TwoCal_datasheet_226KB.pdf)
9. Nyhus Dhillon C, Sarkar D, Klemm RD, et al. Executive summary for the Micronutrient Powders Consultation: Lessons Learned for Operational Guidance. *Matern Child Nutr*. 2017;13 Suppl 1(Suppl 1):e12493. doi:10.1111/mcn.12493
10. World Health Organization. *Clinical Management of Patients with Viral Haemorrhagic Fever: A Pocket Guide for Front-Line Health Workers: Interim Emergency Guidance for Country Adaptation*. World Health Organization; 2016.

## FAQ Patient Care 5. When should nasogastric tube feeding or total parenteral nutrition be used in Ebola Treatment Units (ETUs)?

### *Use of nasogastric tube (NGT) feeding in ETUs*

NGT feeding is indicated when a patient is too weak to eat/drink via the oral route or has major swallowing difficulties. Due to the unique risks and constraints associated with caring for patients with EVD, the use of NGT feeding in ETUs has been highly debated and policies/practices vary.

When an EVD patient could benefit from NGT feeding and tolerates NGT placement, use of an NGT can be considered. All surrounding factors, including context, staff ability and availability and patient condition must be considered in evaluating risk versus benefit. Risks for patients as well as staff must be taken into account.

#### **ARGUMENTS AGAINST AND IN FAVOUR OF USING NGTs IN ETUS**

##### **Arguments against use of NGTs:<sup>1-3</sup>**

- There are barriers to verification of tube placement in the high-risk (red zone) setting.
  - Positioning of NGTs is difficult to monitor regularly as health staff have limited time.
  - Many ETUs have insufficient trained staff to insert and monitor NGTs.
- Patients with sore throat complain about the pain associated with NGTs.
- Some patients oppose insertion and retention of the NGT (and/or are confused), which increases the risk of tearing off staff protective gear during insertion and spraying the virus during removal.
- Severely ill patients who are bleeding and/or vomiting may experience harm from NGT placement.

##### **Arguments in favour of using NGTs:**

- NGT feeding maintains the benefits of the enteral route and avoids the risks associated with intra-venous (IV) catheter insertion.<sup>4</sup>
- NGT feeding allows for more complete nutritional products to be used than what can be provided through IV therapy.

In cases where placement of an NGT is considered, certain conditions must be met to ensure safe and effective use for feeding and hydration in an EVD patient.

### Conditions for use of NGT feeding in an ETU<sup>2,4-6</sup>

- The patient gives consent and tolerates NGT placement.
- The ETU is fully equipped with the appropriate supplies (proper sizes of NGTs, enteral feeding products, pH paper, stethoscopes, etc.).
- The ETU has sufficient and appropriate staff who are experienced in NGT insertion and monitoring.
- A procedure for establishing correct placement of NGT is in place. Testing pH of gastric aspirate via pH indicator strips/paper is recommended (along with checking via stethoscope).

The choice of whether to place an NGT should involve the patient (when possible) and different members of the medical/paramedical team (including doctors, nurses, nutritionists, etc.).

**Extra note about use of NGTs:** NGTs have also been used in ETUs for hydration/rehydration, and to administer water and/or oral rehydration solution in circumstances where adequate oral intake is not possible and where vascular access is difficult or unavailable.<sup>7</sup> The decision to place an NGT for this purpose should be made in accordance with medical (rather than nutritional/dietary) protocols and recommendations.

**Use of NGTs in children:** NGT feeding may be considered on a case-by-case basis for children without vomiting who are too weak to eat or drink.<sup>7</sup> However, NGT feeding should only be considered after other options, such as use of a cup, spoon and/or syringes have failed to provide results.<sup>8</sup> Furthermore, it is important to ensure that a child's dislike of a particular food is not mistaken for poor appetite.

### ***Use of total parenteral nutrition (TPN) in ETUs***

In past outbreaks, the use of total parenteral nutrition (TPN) in the treatment of EVD only took place in high-resource settings. Case reports have mentioned TPN<sup>9-11</sup> but generally lack details or conclusive evidence regarding the benefit to patient outcome.

TPN is not only expensive to purchase but also costly in terms of its implementation and human resources needs, as administration requires specific equipment, nutritional products, the ability to perform multiple laboratory tests and very intensive monitoring by clinical staff<sup>9</sup>.

Furthermore, in a low-resource setting there is concern about the risk of hospital-acquired infection, including fungal infections for which laboratory diagnostic capacity may be limited and required antifungals may not be available. Other complications reported in general use include both fluid overload and dehydration, electrolyte disturbances and refeeding syndrome.<sup>12</sup>

Any potential benefits of TPN use would have to clearly outweigh risks and costs, which is often not the case. Use of TPN is therefore discouraged in ETUs in low-resource settings.

## References

1. World Health Organization, World Food Programme, United Nations Children's Fund (UNICEF). *Interim Guideline: Nutritional Care of Children and Adults with Ebola Virus Disease in Treatment Centres*. World Health Organization; 2014.
2. Ministry of Health and Social Welfare, Republic of Liberia. *Guidelines on Nutritional Care and Support for EVD Patients in Treatment Units and Care Centers - A Practical Guide for Implementing Agencies Involved in the Management and Treatment of EVD in Liberia.*; 2014.
3. Save the Children. *ETC Nutrition Protocol - Kerry Town Ebola Treatment Centre*. V2 ed.; 2015.
4. International Committee of the Red Cross (ICRC), Médecins Sans Frontières (MSF OCB/OCG). *Nutritional Protocol for Patients Infected with Ebola Virus Disease*. v 3.; 2016.
5. République Démocratique du Congo, Ministère de la Santé, Programme National de Nutrition (PRONANUT), with support from UNICEF. *Protocole de Soins Nutritionnels Dans Le Context de La Maladie a Virus Ebola and République Democratique Du Congo.*; 2019.
6. World Health Organization. *Optimized Supportive Care for Ebola Virus Disease: Clinical Management Standard Operating Procedures*. World Health Organization; 2019.
7. Partners in Health (PIH). *Nutritional Care for Patients at Maforki Ebola Holding and Treatment Center*. Version 2.2.; 2015.
8. GOAL. *International Package of Tools and Protocols for Ebola Treatment Units.*; 2014.
9. Johnson DW, Sullivan JN, Piquette CA, et al. Lessons Learned: Critical Care Management of Patients With Ebola in the United States\*. *Crit Care Med*. 2015;43(6):1157-1164. doi:10.1097/CCM.0000000000000935
10. Kreuels B, Wichmann D, Emmerich P, et al. A Case of Severe Ebola Virus Infection Complicated by Gram-Negative Septicemia. *N Engl J Med*. 2014;371(25):2394-2401. doi:10.1056/NEJMoa1411677
11. Uyeki TM, Mehta AK, Davey RT, et al. Clinical Management of Ebola Virus Disease in the United States and Europe. *N Engl J Med*. 2016;374(7):636-646. doi:10.1056/NEJMoa1504874
12. Sexton, J., Campbell, H., Turner, P. & Rahman, M. (2009). Parenteral nutrition in adults: the basics. *The Pharmaceutical Journal*. Published online: September 2009.

## **FAQ Patient Care 6. What are the dietary recommendations for Ebola Treatment Unit (ETU) patients with diarrhoea and/or vomiting and subsequent electrolyte abnormalities?**

Diarrhoea and vomiting are among the most frequent symptoms in EVD; they can have an enormous negative impact on a patient's hydration and nutritional status.

One of the consequences of fluid loss is abnormally low electrolyte concentrations, most commonly potassium and calcium.<sup>1</sup>

### ***Dietary recommendations for patients with diarrhoea:***

- Continue to offer food and fluids (including to those receiving IV fluids) and ensure adequate intake.<sup>2</sup>
- Do NOT offer sugary carbonated drinks or fruit juices as their high osmolarity may exacerbate diarrhoea.<sup>3</sup>
- Avoid providing foods high in insoluble fibre (i.e., whole grains) to patients with profuse diarrhea. Reintroduction of insoluble fibre should be done progressively, and once diarrhoea is resolved.<sup>4</sup>
- Ready-to-use therapeutic food (RUTF) or ready-to-use supplementary food (RUSF) in the form of a biscuit or paste should only be given to those able to drink sufficient water by themselves (a minimum ratio of 1 ml of water for each kcal of the diet).<sup>4</sup>
- Ensure timely feeding (before the patient becomes catabolic), and if possible and acceptable, provide protein containing foods during rehydration with IV and/or oral rehydration solution (ORS), despite diarrhoea.<sup>5</sup>
- For patients with profuse or persistent diarrhoea, providing rice water and porridges may be helpful in decreasing stool output (see Annex 1 for recipes). Rice water can be consumed on demand, instead of water, between meals and doses of ORS.<sup>6,7</sup>
- If temporary lactose intolerance is suspected, consider providing a dairy-free (lactose-free) diet for a period of 24–48 hours. Replace regular diet with a diet consisting of rice porridge, starting with a light porridge without oil. If diarrhoea diminishes, progress to a stronger porridge with oil as tolerated.<sup>6,7</sup>
  - This porridge is low in protein; it should therefore not be prescribed for an extended period.<sup>6,7</sup>
  - An alternative is to mix RUTF with the rice porridge, gradually increasing the amount.<sup>6,7</sup>
- Prescribe zinc to children (20 mg/day) and infants under 6 months of age (10 mg/day) with diarrhoea for the period of 10–14 days.<sup>2</sup>
  - If the child is receiving F75 or F-100, do not prescribe extra zinc as F75 and F-100 already contains the recommended amount to meet an EVD patient's needs.<sup>4</sup>

### ***Dietary recommendations for patients with profuse vomiting:***

- Space meals into small and frequent feedings.<sup>4</sup>
- Provide ORS and monitor signs of dehydration.<sup>2</sup>
- Keep the patient hydrated; this is essential for clinical status but can also help alleviate the symptom.<sup>4</sup>
- RUTF or RUSF should only be given to those who are able to drink sufficient water by themselves (a minimum ratio of 1 ml of water for each kcal of the diet).<sup>4</sup>
- Ensure timely feeding (before the patient becomes catabolic) and if possible and acceptable provide protein containing foods during rehydration with IV and/or ORS, despite vomiting.<sup>5</sup>
- Discuss with the medical team regarding the utility of adding antiemetic medication.

### ***Dietary recommendations for patients with hypokalemia (low serum potassium):***

**NOTE: The following guidance does NOT replace the necessary clinical management of electrolyte imbalances – see appropriate clinical guidance for this [here](#).<sup>13</sup>**

- Aim for a diet rich in potassium (3-4 g/day).<sup>3</sup> Foods rich in potassium should be prioritized in the selection of food and beverages in the diet (see Annex 2 for list of foods).<sup>4</sup>
- Some foods may be rich in potassium when raw, but they lose a lot during cooking (e.g., cereals, fish, green leafy vegetables). If food is boiled, an important part of the potassium is lost in the water (unless it is used for soup and the patient also consumes the water in which the vegetables have been boiled). Fish should preferably be grilled rather than boiled and green leaves should be cooked in a saucepan for a short time and then added to the sauce or the meal.<sup>8</sup>
- Coconut/jelly water (54 mEq/L) and bananas (10 mEq/banana) are well-accepted foods rich in potassium.<sup>2</sup>
- Specialized nutrition products such as Super Cereal and RUTF may be helpful as they are rich in potassium.<sup>2,3</sup>

### ***Dietary recommendations for patients with serum calcium abnormalities***

**NOTE: The following guidance does NOT replace the necessary clinical management of electrolyte imbalances – see appropriate clinical guidance for this [here](#).<sup>13</sup>**

Hypocalcemia (low serum calcium)

- Promote consumption of calcium-rich foods (see Annex 3).

Hypercalcemia (high serum calcium)

- Maximize oral rehydration with ORS and/or other fluids.
- Limit/avoid consumption of calcium-rich foods and drinks (see Annex 3).



### *Dietary recommendations for patients with serum sodium abnormalities*

**NOTE: The following guidance does NOT replace the necessary clinical management of electrolyte imbalances – see appropriate clinical guidance for this [here](#).**<sup>13</sup>

Hyponatremia (low serum sodium)

- Principally a water balance disorder; management should consider volume status (hypovolemia).
- Increase consumption of sodium-rich foods (see Annex 3 for the list of foods).<sup>3</sup>
- Specialized nutrition products, such as Super Cereal and RUTF, may be helpful as they are rich in sodium.<sup>3</sup>
- If hypovolemic: encourage consumption of ORS instead of water (see Annex 3 for list of foods).

Hypernatremia (high serum sodium)

- Increase fluid intake.
- Limit the consumption of sodium-rich foods (see Annex 3).<sup>3</sup>
- Avoid consumption of RUTF as it is rich in sodium.<sup>3</sup>

## **ANNEXES**

### **Annex 1. Recipes for rice water and rice porridge**<sup>9</sup>

#### **1. Rice water**

- Boil 50 to 60 g of rice (dry weight) in 1 litre of water for 30 minutes (covered to avoid evaporation)
- Filter and retain liquid
- Add 1 to 2 tbsp of sugar to liquid

#### **2. Light rice porridge**

- Boil 50 to 60 g of rice (dry weight) in 1 litre of water for 30 minutes (covered to avoid evaporation)
- Crush rice
- Add 1 to 2 tbsp of sugar

#### **3. Rice porridge (enriched)**

- Cook 80 g of crushed rice (or rice flour) in ± 300 ml of water for 15 to 20 minutes
- Add 15 g (1 tbsp) sugar (and 20 g oil)

This porridge provides 525 or 348 kcal depending on whether oil is added; it is low in protein (only 4.2 per cent or 6.4 per cent of caloric content).

## Annex 2. Foods rich in potassium<sup>10</sup>

Food	Classification (potassium mg/100 g edible portion)		
	High (250–499)	Very high (500–750)	Extremely high (751–1190)
<b>Starchy roots, tubers</b>			
Cassava flour		X	
Cassava tuber dried		X	
Cocoyam tuber, raw or boiled	X		
Potato, boiled	X		
Sweet potato, boiled	X		
Yam tuber, boiled		X	
<b>Legumes</b>			
African yam bean, boiled	X		
Bambara groundnut, dried, boiled	X		
Bambara groundnut, dried, raw			X
Beans, white, boiled	X		
Peas, boiled	X		
Soya beans, boiled		X	
<b>Vegetables</b>			
Garlic, raw		X	
Green leaves (amarante, baobab, cassava, roselle, spinach, vernonia), raw or boiled <sup>b</sup>	X		
Parsley, fresh		X	
Tomato paste, concentrated			X

<sup>b</sup> Around 50% is lost through boiling (unless cooked as a soup and the patient also eats the cooking liquid). Preferably cook for a short time in a saucepan.

Food	Classification (potassium mg/100 g edible portion)		
	High (250–499)	Very high (500–750)	Extremely high (751–1190)
<b>Nuts and seeds</b>			
Cashew nuts, raw		X	
Coconut, kernel, dried, raw		X	
Coconut, mature kernel, fresh, raw	X		
Groundnut, shelled, dried, raw		X	
Melon seeds		X	
Sesame seeds	X		
<b>Meat and poultry</b>			
Goat meat, boiled or grilled	X		
Pork meat, grilled	X		X
Rabbit meat, grilled	X		
<b>Fish</b>			
Most fish, especially anchovy, carp, mackerel and sardine, preferably grilled, rather than boiled		X	
<b>Fruits</b>			
Avocado, pulp	X		
Baobab fruit/monkey bread (pulp)			X
Coconut milk/water	X		
Dates (dry)		X	
Dattock dried pulp			X
Dattock pulp, raw	X		
Figs (dry)			X
Mango pale orange/deep orange	X		
Melon	X		
Orange	X		
Papaya	X		
Plantain, ripe, raw		X	
Plantain, ripe, boiled	X		
Tamarind fruit, ripe, raw		X	

### Annex 3. Foods and drinks that are rich in calcium or sodium:<sup>3,11,12</sup>

	Rich in calcium	Rich in sodium
<b>Vegetables</b>	Green leafy vegetables: broccoli, collard greens, kale, okra	
<b>Foods of animal origin</b>	Dairy: cheese, yoghurt Fish with bones that are eaten: sardines, pilchards	Eggs Fresh fish Lean meat Poultry Yoghurt Cheese
<b>Beverages</b>	Milk	Milk
<b>Cereal and grains</b>	Calcium-fortified flours and cereals	Brown or wild rice Oats Whole wheat bread
<b>Legumes</b>	Beans Soybeans	Lentils Peas Soybeans
<b>Fruit</b>	Figs (dried) Oranges	
<b>Other</b>	RUTF	Processed foods

### References

1. Lyon GM, Mehta AK, Varkey JB, et al. Clinical care of two patients with Ebola virus disease in the United States. *N Engl J Med*. 2014;371(25):2402-2409. doi:10.1056/NEJMoa1409838
2. World Health Organization. *Clinical Management of Patients with Viral Haemorrhagic Fever: A Pocket Guide for Front-Line Health Workers: Interim Emergency Guidance for Country Adaptation*. World Health Organization; 2016.
3. République Démocratique du Congo, Ministère de la Santé, Programme National de Nutrition (PRONANUT), with support from UNICEF. *Protocole de Soins Nutritionnels Dans Le Context de La Maladie a Virus Ebola and Republique Democratique Du Congo*.; 2019.
4. Ministry of Health and Social Welfare, Republic of Liberia. *Guidelines on Nutritional Care and Support for EVD Patients in Treatment Units and Care Centers - A Practical Guide for Implementing Agencies Involved in the Management and Treatment of EVD in Liberia*.; 2014.
5. Ververs M, Anantharam P. Nutritional Care For Patients With Ebola Virus Disease In Ebola Treatment Units: Past And Current Experiences. *US Dep Health Hum Serv Cent Dis Control Prev*. Published online August 26, 2019:28.
6. International Medical Corps (IMC). *Nutrition Guidelines for Ebola Treatment Centers*.; 2014.
7. Médecins Sans Frontières (MSF). *2018 Filovirus Disease Guidelines - Draft, Appendix X: Nutritional Tools for Patients Infected with Filovirus Disease*.; 2018.
8. Save the Children. *ETC Nutrition Protocol - Kerry Town Ebola Treatment Centre*. V2 ed.; 2015.
9. International Committee of the Red Cross (ICRC), Médecins Sans Frontières (MSF OCB/OCG). *Nutritional Protocol for Patients Infected with Ebola Virus Disease*. v 3.; 2016.
10. Stadlmayr B, Charrondiere UR, Enujiugha VN, Bayili RG, Fagbohoun EG, Samb B et al. *West African Food Composition Table*. Food and Agriculture Organization of the United Nation; 2012. [www.fao.org/docrep/015/i2698b/i2698b00.pdf](http://www.fao.org/docrep/015/i2698b/i2698b00.pdf)
11. Vitamins and minerals - Calcium. nhs.uk. Published October 23, 2017. <https://www.nhs.uk/conditions/vitamins-and-minerals/calcium/>
12. A Guide to Calcium-Rich Foods. Bone Health & Osteoporosis Foundation. <https://www.bonehealthandosteoporosis.org/patients/treatment/calciumvitamin-d/a-guide-to-calcium-rich-foods/>
13. World Health Organization. *Optimized Supportive Care for Ebola Virus Disease: Clinical Management Standard Operating Procedures*. World Health Organization; 2019. <https://www.who.int/publications/i/item/optimized-supportive-care-for-ebola-virus-disease>

## FAQ Patient Care 7. Which drugs can have nutrition interactions in Ebola Treatment Units (ETUs)?

Some of the drugs commonly used for case management in EVD patients can impact or be impacted by a patient's diet and nutrition. Special care must therefore be taken when administering these drugs.

Table 1 includes drugs from the 'WHO *Optimized Supportive Care for Ebola Virus Disease - Clinical Management Standard Operating Procedures (2019)*' that may warrant special attention, and recommendations for avoiding side effects. Please note, this list is not exhaustive.

**Table 1. EVD case management drugs with known diet and nutrition interactions**

Drug	Drug administration route	Drug category/ indication	Caution regarding diet and nutrition	Recommendations
Ceftriaxone	IV	Antibiotic	Ceftriaxone is highly susceptible to binding calcium within the IV catheter, forming a complex, which can be fatal. <sup>1,2</sup> Calcium deposition can result from administration of Lactated Ringer's and ceftriaxone in the same IV line. <sup>3</sup>	<ul style="list-style-type: none"> <li>For patients receiving IV Lactated Ringer's: flush line with at least 10 ml 0.9 per cent saline before using line to administer ceftriaxone.<sup>3</sup></li> </ul>
Cefixime	PO	Antibiotic	Cefixime can form complexes with divalent ions, such as calcium and magnesium, reducing absorption.	<ul style="list-style-type: none"> <li>Avoid concomitant intake with milk products. Consumption of dairy products can be continued but with close monitoring for drug reaction.<sup>1</sup></li> </ul>
Ciprofloxacin	IV/PO	Antibiotic	Ciprofloxacin absorption is reduced by casein (protein present in milk) and multivalent cations, such as calcium, iron, zinc and magnesium. <sup>1,4</sup>  Drug bioavailability when administered through nasogastric tube feeding tube is decreased by 27–67 per cent. <sup>2</sup>	<p>If administered orally:</p> <ul style="list-style-type: none"> <li>Avoid concomitant intake with milk products.<sup>1</sup></li> <li>Avoid concomitant intake with orange juice.<sup>5</sup></li> <li>Avoid giving with vitamins and micronutrients (e.g., iron, calcium, magnesium) or with antacids (e.g., aluminum hydroxide or magnesium hydroxide).</li> </ul> <p>If administered via nasogastric tube:</p> <ul style="list-style-type: none"> <li>Suspend enteral nutrition for 1–2 hours before and 1–2 hours after drug administration). Drug dosage adequacy should be checked.<sup>2</sup></li> </ul>

Drug	Drug administration route	Drug category/ indication	Caution regarding diet and nutrition	Recommendations
Ceftriaxone	IV	Antibiotic	Ceftriaxone is highly susceptible to binding calcium within the IV catheter, forming a complex, which can be fatal. <sup>1,2</sup> Calcium deposition can result from administration of Lactated Ringer's and ceftriaxone in the same IV line. <sup>3</sup>	<ul style="list-style-type: none"> <li>For patients receiving IV Lactated Ringer's: flush line with at least 10 ml 0.9 per cent saline before using line to administer ceftriaxone.<sup>3</sup></li> </ul>
Cefixime	PO	Antibiotic	Cefixime can form complexes with divalent ions, such as calcium and magnesium, reducing absorption.	<ul style="list-style-type: none"> <li>Avoid concomitant intake with milk products. Consumption of dairy products can be continued but with close monitoring for drug reaction.<sup>1</sup></li> </ul>
Cloxacillin / Dicloxacillin	IV/PO	Antibiotic	Cloxacillin binds to divalent cations, such as calcium and magnesium, forming a complex and reducing absorption. <sup>1</sup>	<p>If administered orally:</p> <ul style="list-style-type: none"> <li>Avoid concomitant intake with milk products. Consumption of dairy products can be continued but with close monitoring for drug reaction.<sup>1</sup></li> </ul>
Metoclopramide	IV/PO	Heartburn, acid reflux, GERD, stomach discomfort, gastroparesis, vomiting	Decreased food absorption <sup>3</sup>	<ul style="list-style-type: none"> <li>Space meals into more frequent and smaller feedings.<sup>3</sup></li> <li>Maintain optimal hydration.<sup>3</sup></li> </ul>
Phenytoin	IV/PO	Anti-convulsant	Phenytoin is highly bound to albumin; free albumin may have elevated levels in patients with severe malnutrition and low albumin levels. <sup>7</sup> Phenytoin level is decreased by up to 70 per cent when co-administered with enteral nutrition formulation or through nasogastric tube. <sup>2,7</sup>	<p>Any mode of administration:</p> <ul style="list-style-type: none"> <li>Free phenytoin levels should be monitored when serum albumin concentration is &lt; 3 g/dL.<sup>8</sup></li> </ul> <p>If administered via NGT:</p> <ul style="list-style-type: none"> <li>Suspend enteral nutrition -2 hours before and after dose.<sup>8</sup></li> <li>Tube should be flushed prior to and following drug administration. Patients should be closely monitored.<sup>4,8</sup></li> </ul>
Ranitidine	PO	Anti-ulcer (stress ulcer)	Reduced acid production in the stomach. <sup>6</sup>	<ul style="list-style-type: none"> <li>Space meals into more frequent feedings in smaller portions.<sup>6</sup></li> </ul>

PO = Per os (orally). IV = Intra-venous. GERD = Gastro-esophageal reflux disease

## References

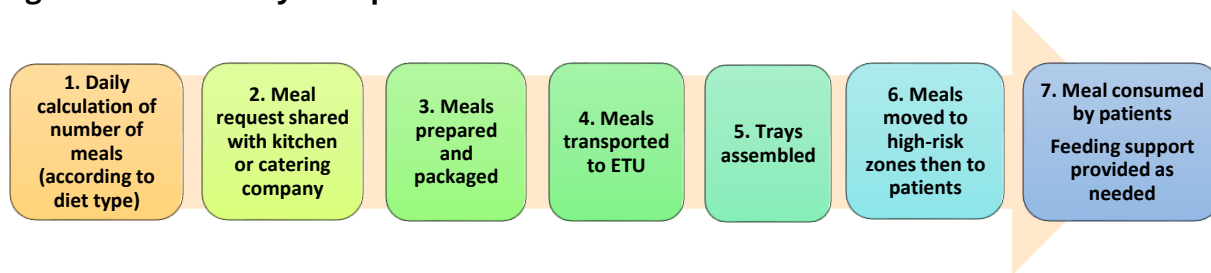
1. Bushra R, Aslam N, Khan AY. Food-Drug Interactions. *Oman Med J*. 2011;26(2):77-83. doi:10.5001/omj.2011.21
2. Bayraktar Ekincioglu A, Demirkan K. Clinical nutrition and drug interactions. *Turk J Surg*. 2014;29(4):177-186. doi:10.5152/UCD.2013.112013
3. World Health Organization. *Clinical Management of Patients with Viral Haemorrhagic Fever: A Pocket Guide for Front-Line Health Workers: Interim Emergency Guidance for Country Adaptation*. World Health Organization; 2016.
4. Boullata JJ. Enteral Medication for the Tube-Fed Patient: Making This Route Safe and Effective. *Nutr Clin Pract*. 2021;36(1):111-132. doi:10.1002/ncp.10615
5. Fruit Juices as Perpetrators of Drug Interactions: The Role of Organic Anion-Transporting Polypeptides - Dolton - 2012 - Clinical Pharmacology & Therapeutics - Wiley Online Library. Accessed December 1, 2022. <https://ascpt.onlinelibrary.wiley.com/doi/10.1038/clpt.2012.159>
6. Ministry of Health and Social Welfare, Republic of Liberia. *Guidelines on Nutritional Care and Support for EVD Patients in Treatment Units and Care Centers - A Practical Guide for Implementing Agencies Involved in the Management and Treatment of EVD in Liberia.*; 2014.
7. Gilbert S, Hatton J, Magnuson B. How to Minimize Interaction Between Phenytoin and Enteral Feedings: Two Approaches. *Nutr Clin Pract*. 1996;11(1):28-31. doi:10.1177/011542659601100128
8. Magnuson BL, Clifford TM, Hoskins LA, Bernard AC. Enteral Nutrition and Drug Administration, Interactions, and Complications. *Nutr Clin Pract*. 2005;20(6):618-624. doi:10.1177/0115426505020006618
9. Ranitidine Hydrochloride Capsules and Tablets (ranitidine hydrochloride) dose, indications, adverse effects, interactions... from PDR.net. <https://www.pdr.net/drug-summary/Ranitidine-Hydrochloride-Capsules-and-Tablets-ranitidine-hydrochloride-2965>

## FAQ Food Systems 1. How should meal preparation and food/drink distribution be managed in ETUs? (ETU food system)

An ETU's food system is the web of activities destined to provide proper nutrition to patients. It includes procurement, preparation, transport, distribution and consumption of food. A well-organized food system provides successful management of patient feeding according to their specific dietary needs.

The nutrition care process outlines the specific sequence of steps that lead to individual patients receiving meals (see FAQ G1). A significant portion of these steps lie within an ETU's food system; this is sometimes referred to as the ETU food chain. See Figure 1 for an example.

**Figure 1. ETU Food system processes / Food chain**



Clear procedures, schedules and distribution of tasks and responsibilities are key to proper food system functioning. Establishing and following such procedures is particularly important in the context of EVD to ensure hygiene measures are respected.

See below for meal scheduling, meal calculation and meal requests. For information regarding where meals should be prepared, see FAQ FS2. FAQ FS3 covers measures to be taken to ensure proper hygiene during meal preparation and FAQ FS4 covers food/drink packaging and transportation to a patient's bedside. Refer to FAQ G3 for special considerations in supporting ETU patients with feeding. And finally, FAQ FS5 provides instructions that can be provided to family/friends of patients wishing to provide food/drinks.

### **When should meals and snacks be served?**

Adults and children  $\geq 2$  years old should be offered 3 meals and 2-3 snacks daily. Meal frequency for children  $< 2$  years old depends on age. Each ETU should establish a daily schedule that best fits its needs, resources, and local habits. See below for meal schedule example. (See FAQs PC2 & PC3 for age-specific dietary recommendations).



**Table 1. ETU meal schedule example<sup>1</sup>**

Age	6h	8h	9h	10h	12h	14h	15h	16h	18h	20h	21h	22h	24h	2h	3h
0-1 months	milk		milk		milk		milk		milk		milk		milk		milk
1-2 months	milk		milk		milk		milk		milk			milk		milk	
2-5 months	milk			milk		milk			milk			milk		milk	
6-23 months*	milk		milk					milk		milk					
		breakfast			lunch		snack		dinner						
Patients >2 years		breakfast		snack	lunch		snack		dinner	snack					

\*Milk and food mealtimes may need to be adjusted according to child’s age and sleeping schedule and staff/caretaker availability to provide feeding assistance.

**How should meals be served?**

Food and drink must be delivered to patients in individual packaging or disposable containers. (See FAQ FS4 for food/drink packaging).

Either single use (disposable) or regular (reusable) utensils can be used. If single use, they must be treated as infectious waste and disposed of according to the facilities protocols for managing infectious waste. If reusable, they must be kept on the patient’s ward and dedicated to a single patient, and establish a procedure for cleaning the utensils between use. Once the patient is discharged the utensils may be decontaminated for reuse or disposed of as infectious waste depending upon facility resources and capacity for safe and effective decontamination.<sup>2</sup>

**How to calculate and request the total number of meals required daily?**

Meal requests should be created each day for meals that will be required on the following day. It can be helpful to plan for a few additional meals for each diet type to accommodate immediate needs as well as new admissions, requests for changes in diet type or additional meals.

During daily rounds, the medical team should designate the type of diet that each patient will receive (none, liquid, semi-solid, solid). In most cases, this is the diet that the patient will start to receive on the following day (with any additional instructions for the same day). This should be clearly recorded on patient’s record or another designated place.

After rounds, diet prescriptions should be collected and compiled into a daily meal request form. Meal requests for kitchen or catering companies should include the number of patients according to:

- Age group (children <1 month, 1–2 months, 2–3 months, 4–5 months, 6–11 months, 12–23 months, 24–59 months, 5–10 years, 11–18 years, adults ≥18 years, pregnant and lactation women)
- Diet consistency (liquid, semi-solid, solid)

After being compiled, meal request information should be transferred from a member of the medical team in the high-risk zone to the nurse station in the low-risk zone, where a new daily meal request form should be filled out. Information can be transferred verbally (at the high-risk fence) or virtually (via photograph or scan).<sup>3</sup>

It may be helpful to have a specific section of the meal request form for meals that are prepared separately from standard meals (principally milk for infants and young children or liquid meals using sip feeds). This is especially important when using a catering service, as milk and sip feeds should be prepared on the ETU site. By a designated time in mid-afternoon, the daily meal request form should be validated and shared with the kitchen or catering company.

## References

1. GOAL. International Package of Tools and Protocols for Ebola Treatment Units.; 2014.
2. World Health Organization, World Food Programme, United Nations Children's Fund (UNICEF). Interim Guideline: Nutritional Care of Children and Adults with Ebola Virus Disease in Treatment Centres. World Health Organization; 2014.
3. Ministry of Health and Social Welfare, Republic of Liberia. Guidelines on Nutritional Care and Support for EVD Patients in Treatment Units and Care Centers - A Practical Guide for Implementing Agencies Involved in the Management and Treatment of EVD in Liberia.; 2014.

## FAQ Food Systems 2. Where should ETU meals be prepared?

### To outsource or not?

ETU patient meals may be prepared directly on the ETU site or outsourced and transported to the ETU site ('catered'). When meal preparation occurs on-site, the kitchen and ingredient procurement are generally under the direct responsibility of the organization managing the ETU.

Many factors contribute to deciding which system of meal provision to use. Each has advantages and disadvantages; see Table 1.

**IMPORTANT: Whatever decision is taken, this must be made fast and efficiently as soon as possible in the outbreak and if there are any foreseeable delays in supplying food for patients (or health care workers) then stop-gap/contingency plans must also have been thought through. The best way to avoid delays or other obstacles in supplying food is to make these decisions and carry out the accompany preparatory actions BEFORE an outbreak as part of emergency preparedness plans.**

**Table 1. Advantages and disadvantages of ETU meal procurement options**

Source of meals	Advantages	Disadvantages/barriers
<b>Prepared onsite</b>	<p>Better oversight and control over the quality of food and hygiene practices used during food preparation</p> <p>Greater choice of ingredients and menus</p> <p>More flexibility in meeting patients' needs in terms of:</p> <ul style="list-style-type: none"> <li>- Mealtimes</li> <li>- Foods offered</li> </ul>	<p>Requires setting up a full-sized kitchen (time, space, budget)</p> <p>Requires recruiting, training, and managing kitchen staff</p> <p>Requires technical expertise (including hygiene control)</p>
<b>Outsourced ('catered')</b>	<p>Fewer human resources to hire and manage</p> <p>May be easier to provide culturally appropriate meals using local products</p>	<p>Transport to ETU not always provided</p> <p>Limited choice of available catering services (may impact quality and price)</p> <p>Small kitchen corner still required at ETU site (see below)</p>

Factors to consider when deciding which option to employ:

- Urgency and time required to set up a full kitchen and hire/train essential staff
- The ETU site and whether there is space for a full kitchen
- Ability to recruit essential kitchen staff (including availability)
- Size of the ETU (expected number of meals required daily)

- Availability of catering services (including location, quality, cost, meal options)
- Whether catering service will transport food to ETU
- Local/national regulations
- Most cost-effective option (dependent on the specific context and factors above)

Important points to consider, regardless of which option is used:

- Time between food preparation and arrival to patient's bedside should be short (to ensure proper food hygiene - see FAQ FS4).
- Meals must be individually packaged prior to being transported into the high-risk zone and to patients' bedsides. If food is catered: individual packaging can be done off-site where food is prepared, or food can be transported in bulk to the ETU and individual packaging can be done onsite.
- A nutritionist should be involved in preparing and selecting menus (whether on-site or giving remote support).
- Food hygiene is essential and quality control measures should be implemented and actively monitored (see FAQ FS3).

A hybrid option for food preparation may be possible. An example is using a catering service that prepares meals at or in very close vicinity to the ETU. Another option might be to use a catering service for solid and semi-solid meals but prepare liquid meals on-site.

Some countries have strict rules and regulations on food systems and food safety, and for contracting and tendering caterers for institutionalized residents, such as hospitalized patients. It is essential to inquire regarding these rules and regulations and to work with local authorities when setting up an ETU food system.

### ***Kitchen corner and tray assembly area***

Whether meal preparation is outsourced or managed onsite, each ETU should have the capacity to prepare or warm up small meals or milk; adapt meals for specific dietary needs (e.g., electrolyte imbalances); provide snacks (daytime and nighttime); and prepare special nutritious products that require reconstitution (e.g., therapeutic milk).

Thus, at minimum, each ETU should have a small **'kitchen corner'**. It must have a fridge, a stove or microwave, hand washing sink, and easy access to potable water. Other material to be included: kitchen utensils, pots/pans, electric kettle, bowls, cups, working tables, small desk and chair, whiteboard, shelves, lockable cupboard(s), garbage bin. Disinfectant and cleaning supplies for food preparation must be present as well as a cleaning of food preparation area. It is essential for this to be kept in mind during ETU planning, to ensure adequate budget and space are allocated.

ETUs must also have a dedicated area for packaging food and preparing it for transport to individual patients, which is called a **'tray assembly area'**. This generally requires 1-2 large tables, shelves for placing food waiting to be packaged and/or placed on trays, shelves for assembled trays, and a whiteboard.

## **FAQ Food Systems 3. What measures should be taken to ensure proper food hygiene in Ebola Treatment Units (ETUs)?**

Foodborne illness is caused by consuming contaminated food or beverages. Even though anyone can get a foodborne illness, those with compromised immune systems are at greater risk of getting sick or developing more serious conditions. Common symptoms of foodborne illness are diarrhoea, nausea, cramping or vomiting – symptoms that also common with EVD.

Food hygiene includes all conditions and measures necessary to ensure the safety and suitability of food at all stages of the food chain. In the case of ETUs, this involves steps from the procurement of food through to its consumption. Whether food preparation is outsourced or managed at the ETU site, food hygiene is crucial and needs to be closely monitored and adjusted when needed.

In as much as is possible, national regulations on food hygiene and quality control systems should be consulted. Coordination with the local authorities is also recommended to ensure that correct standards are implemented and followed.

Whether food preparation is outsourced or not, the following measures can help to ensure that patients receive safe and nutritious foods and drinks:

- Ensure food is stored properly and safely; monitor regularly (see Annex 1 for checklist).
- Apply proper food hygiene measures during preparation; monitor regularly to ensure that quality control measures are being followed (see Annex 2 for checklist).
- Apply correct food hygiene while transporting food and drinks to and within the ETU (see FAQ FS4).
- Ensure that food and drinks are consumed within the appropriate timing (see below under point 4.).

### **1. Food and drink storage (including special nutrition products)**

Whether immediately perishable or not, all food and drinks must be stored properly prior to preparation and consumption. Follow manufacturer guidance wherever possible. Foods and drinks must be kept at appropriate temperatures and be protected from weather elements (extreme hot or cold), moisture and pests. Special care must also be taken to ensure that ingredients are used prior to spoiling or reaching their expiry date.

Extra meals or drinks that are not immediately served to patients after preparation must be stored in airtight containers<sup>1</sup> at the appropriate temperature.

Specialized nutritional products are particularly sensitive to high temperatures and humidity, which can affect their quality. Although product packaging has been specifically designed to protect the products against contamination, infestation, moisture and oxygen from the air, rancidity, loss of nutrient value, etc., quality issues may still occur when products are not properly stored.<sup>2</sup> Specialized nutrition products should therefore be stored in a cool and dry area, where temperature is maintained at less than 30°C. This can be a well-ventilated area without direct sunlight in or near the ETU green zone, ideally near the food preparation and tray assembly line stations. Additional product-specific storage instructions are provided on individual product packaging.

All locations where food is stored must be checked regularly to ensure basic quality control measures are respected. See Annex 1 for an inspection checklist.

## **2. Food hygiene during preparation**

WHO has outlined five keys to ensure food safety and prevent foodborne illness (see Figure 1); these should be strictly adhered to during ETU food preparation.

The following measures have also been proposed for ETUs:<sup>3</sup>

- Kitchen staff must perform hand hygiene at critical points in the food preparation process:
  - Before handling food
  - After handling raw food
  - After handling rubbish
  - After coughing or sneezing
  - After going to the toilet
  - After cleaning equipment and utensils
- Kitchen staff must wear clean aprons and hair coverings at the beginning of each shift; these are removed at the end of the shift and are taken to the laundry.
- All food preparation activities take place on pre-cleaned, non-porous cleanable surfaces.
  - Surfaces should be cleaned before and after food preparation and packaging with 0.5 per cent chlorine solution.

All sites where food and drinks are prepared should be inspected regularly to ensure that essential measures are in place and being followed correctly. This applies to sites within or alongside the ETU, as well as those that are offsite where outsourced meals are prepared (if applicable).

See Annex 2 for an inspection checklist.

## **3. Food hygiene during transportation**

See FAQ FS4 for details regarding transportation of food and drinks to and within the ETU.

Figure 1. WHO: Five keys to safer food<sup>4</sup>

# Five keys to safer food




## Keep clean

- ✓ Wash your hands before handling food and often during food preparation
- ✓ Wash your hands after going to the toilet
- ✓ Wash and sanitize all surfaces and equipment used for food preparation
- ✓ Protect kitchen areas and food from insects, pests and other animals

**Why?**

While most microorganisms do not cause disease, dangerous microorganisms are widely found in soil, water, animals and people. These microorganisms are carried on hands, wiping cloths and utensils, especially cutting boards and the slightest contact can transfer them to food and cause foodborne diseases.



## Separate raw and cooked

- ✓ Separate raw meat, poultry and seafood from other foods
- ✓ Use separate equipment and utensils such as knives and cutting boards for handling raw foods
- ✓ Store food in containers to avoid contact between raw and prepared foods

**Why?**

Raw food, especially meat, poultry and seafood, and their juices, can contain dangerous microorganisms which may be transferred onto other foods during food preparation and storage.



## Cook thoroughly

- ✓ Cook food thoroughly, especially meat, poultry, eggs and seafood
- ✓ Bring foods like soups and stews to boiling to make sure that they have reached 70°C. For meat and poultry, make sure that juices are clear, not pink. Ideally, use a thermometer
- ✓ Reheat cooked food thoroughly

**Why?**

Proper cooking kills almost all dangerous microorganisms. Studies have shown that cooking food to a temperature of 70°C can help ensure it is safe for consumption. Foods that require special attention include minced meats, rolled roasts, large joints of meat and whole poultry.



## Keep food at safe temperatures

- ✓ Do not leave cooked food at room temperature for more than 2 hours
- ✓ Refrigerate promptly all cooked and perishable food (preferably below 5°C)
- ✓ Keep cooked food piping hot (more than 60°C) prior to serving
- ✓ Do not store food too long even in the refrigerator
- ✓ Do not thaw frozen food at room temperature

**Why?**

Microorganisms can multiply very quickly if food is stored at room temperature. By holding at temperatures below 5°C or above 60°C, the growth of microorganisms is slowed down or stopped. Some dangerous microorganisms still grow below 5°C.



## Use safe water and raw materials

- ✓ Use safe water or treat it to make it safe
- ✓ Select fresh and wholesome foods
- ✓ Choose foods processed for safety, such as pasteurized milk
- ✓ Wash fruits and vegetables, especially if eaten raw
- ✓ Do not use food beyond its expiry date

**Why?**

Raw materials, including water and ice, may be contaminated with dangerous microorganisms and chemicals. Toxic chemicals may be formed in damaged and mouldy foods. Care in selection of raw materials and simple measures such as washing and peeling may reduce the risk.



#### 4. Timely food and drink consumption

It is important to monitor the time that perishable food and drinks remain at the patient’s bedside (red/high-risk zone); they should generally not be left longer than 1-2 hours. Food and drinks that are not consumed within the specified time period should be removed and discarded as infectious material.

Cooked food (including soup and porridges) should generally be consumed within 2 hours after preparation. Depending on where meals are prepared, and the system in place for getting food to patients, a large part of this time may be taken up in transportation (see FAQ FS4). However, it is essential to ensure that food that is intended to be eaten hot is still hot/warm when it reaches the patient to increase palatability and the likelihood that the patient will want to consume the food. Use containers that can keep food hot and try to reduce transport time from cooking to bedside as much as possible.

Special nutrition product drinks should generally be consumed within 1 or 2 hours after opening (for ready to drink products) or after reconstitution.

Ready-to-use therapeutic food and ready-to-use supplementary food (RUTF/RUSF) are among the foods that can be left longest at bedside. The paste form can be left for up to 12 hours once opened, if left in its original package, but it must be sealed (e.g., using a clip) and stored in an airtight container/bag.

Non-perishable food/drink can be stored at room temperature and left at the bedside for days if untouched and protected against insects and rodents.<sup>3</sup>

See Table 1 and FAQ PC4 for additional information regarding specialized nutrition products.

**Table 1. Recommended time limit for consuming special nutrition products after opening or preparing**

Product	Time limit for consuming after opening
Ready-to-use infant formula (RUIF)	1 hour at room temperature <sup>5</sup>
Powdered infant formula (PIF)	<i>Unprepared (powder):</i> 1 month <i>Prepared (reconstituted):</i> 1 hour at room temperature <sup>5</sup> , 24 hours in refrigerator
Ultra-high temperature (UHT) milk	2 hours at room temperature, 7 days in refrigerator
F75 and F100 therapeutic milk	<i>Unprepared (powder):</i> 1 week <i>Prepared (reconstituted):</i> 2 hours at room temperature
RUTF and RUSF in paste form (e.g., Plumpy'nut, EezeePaste)	12 hours at room temperature (opened and still in original packaging, but sealed or in an airtight container) <sup>6</sup>
High energy drinks (sip feeds)	2 hours at room temperature, 24 hours in refrigerator (recapped) <sup>7</sup>



## ANNEXES

**Annex 1. Food storage checklist** (Source: Adapted from Food and Agriculture Organization (FAO)<sup>8</sup> and South Dakota Department of Public Health checklists<sup>9</sup>)

Date:

Observer(s):

Note: Ensure a person with water, sanitation and hygiene expertise is included in the inspection.

### ***Warehouse or site of food storage for dry unprepared ingredients***

#### **Food**

- All food supplies are 15–20 cm off the floor
- All food supplies are stored at least 1 meter away from the walls
- All food is labelled with name and delivery date
- The FEFO (first expired, first out) method of inventory is practiced
- Expiry dates are respected
- There are no bulging or leaking canned goods
- Food is protected from contamination and no food sacks or cans are open or uncovered

#### **Pest control**

- Storage is rodent proof
- Doors are in good condition
- Windows that can be opened have intact screens
- No evidence of pests or raw material residues
- No cracks in walls
- Roof is intact
- No open or leaking water source; drainage functions properly

#### **Garbage storage and disposal**

- Garbage cans are emptied as necessary
- Boxes and containers are removed from site

**Miscellaneous**

- All surfaces and floors are clean
- Chemicals (e.g., chlorine, pesticides, insecticides) and products such as fuel and soap are stored away from food and other food related supplies
- All food scales function properly

***Refrigerators/coolers for perishable food/drinks (unprepared and/or prepared)***

- For each unit a thermometer is present, clear and accurate and accompanied by a logbook to record temperatures each day (1-2 times per day)
- All food is properly wrapped, labelled and dated
- The FEFO (first expired, first out) method of inventory is being practiced
- Units are clean

**Criteria that are not fulfilled:**

**Corrective action(s):**

**Annex 2. Food hygiene during preparation checklist** (Source: Adapted from Food and Agriculture Organization (FAO)<sup>8</sup> and South Dakota Department of Public Health checklists<sup>9</sup>)

Date:

Observer(s):

Note: Ensure a person with water, sanitation and hygiene expertise is included in the inspection.

**Personal dress and hygiene**

- Employees wear proper and clean clothing
- Hair restraints are worn
- Fingernails are short, unpolished and clean
- Jewelry is limited to watch, simple earrings and plain rings
- Open sores, cuts or splints and bandages on hands are completely covered while handling food
- Hands are washed thoroughly using proper hand-washing procedures (and/or gloves are changed) at critical points
- A non-smoking policy is observed near preparation, storage and washing areas
- Employees cough into their elbow and wash hands thoroughly with soap and water after coughing or sneezing
- Employees wash their hands with soap after toilet use, before food preparation and after touching raw foods
- Disposable tissues are used and disposed of when coughing/blowing nose and wash their hands with soap and water after coughing /blowing nose
- Employees are in good health; sick employees are not permitted to work in or near the kitchen
- A person is dedicated to monitoring hygiene during food preparation

**Utensils and equipment (applies to utensils used within the kitchen only)**

- A minimum of two-compartment sink is properly set up for cleaning and sanitizing (rinse/wash, sanitize)
- Reusable towels are used only for cleaning and sanitizing equipment surfaces and not for drying hands, utensils, floor, etc.
- All small equipment and utensils, including cutting boards, are sanitized between uses
- Small equipment and utensils are air dried
- Work surfaces are clean to sight and touch
- Work surfaces are washed and sanitized between uses

- Food thermometers are washed and sanitized between each use
- Can opener is clean to sight and touch
- Drawers and racks are clean
- Small equipment is inverted, covered or otherwise protected from dust, insects or contamination when stored
- All other pieces of equipment are clean to sight and touch – equipment on serving lines, storage shelves, cabinets, ovens, etc.

### **Food handling**

- Vegetables and fruits are washed according to proper protocol
- Food is never at risk of cross-contamination (raw and prepared food are always separated)
- Food is handled with utensils, clean gloved hands or clean hands
- Utensils are handled in a manner that avoids touching parts that will be in direct contact with food
- When cooking food, at least one 'kill step' is used to remove potential pathogens (e.g., heating food to at least 70°C)
- Food is tasted hygienically (e.g., using clean utensils)
- Perishable and prepared food is not allowed to be in the "temperature danger zone" (5°C to 60°C) for more than 2 hours
- Food is labelled properly and with correct patient code (no patient names are used) before distribution

### **Hot holding**

- Unit is clean
- Food is heated to 70°C before being placed in hot holding
- Temperature of food being held is above 60°C
- Food is protected from contamination

### **Garbage/rubbish**

- Kitchen garbage cans are clean
- Garbage cans are emptied as necessary

**Criteria that are not fulfilled:**

**Corrective action(s) to be taken:**

## References

1. Save the Children. *ETC Nutrition Protocol - Kerry Town Ebola Treatment Centre*. V2 ed.; 2015.
2. Ministry of Health and Social Welfare, Republic of Liberia. *Guidelines on Nutritional Care and Support for EVD Patients in Treatment Units and Care Centers - A Practical Guide for Implementing Agencies Involved in the Management and Treatment of EVD in Liberia*; 2014.
3. GOAL. *International Package of Tools and Protocols for Ebola Treatment Units*; 2014.
4. World Health Organization. Five keys to safer foods manual. Published online 2006.
5. CDC. Infant Formula Preparation and Storage. Centers for Disease Control and Prevention. Published July 13, 2022. <https://www.cdc.gov/nutrition/infantandtoddlernutrition/formula-feeding/infant-formula-preparation-and-storage.html>
6. World Health Organization, World Food Programme, United Nations Children's Fund (UNICEF). *Interim Guideline: Nutritional Care of Children and Adults with Ebola Virus Disease in Treatment Centres*. World Health Organization; 2014.
7. Peptamen® Vanilla Liquid Sip Feed | Nestlé Health Science. <https://www.nestlehealthscience.co.uk/brands/peptamen/peptamen-vanilla-bottles#:~:text=Shelf%20life%20of%20months%20from%20date%20of%20manufacture>.
8. Codex Alimentarius Commission, Joint FAO WHO Food Standards Programme, eds. *Food Hygiene: Basic Texts; Codex Alimentarius*. 4. ed. FAO [u.a.]; 2009.
9. South Dakota Department of Public Health. Food Service Manager Self-Inspection Checklist. <https://doh.sd.gov/documents/Food/Checklist.pdf> (Accessed 4 August 2021).

## **FAQ Food Systems 4. How should food be safely transported to and within an Ebola Treatment Unit (ETU)?**

Before reaching a patient, all food and drinks must move from the site of storage or preparation, through the low-risk zone and tray assembly area, into the high-risk zone, and to the bedside. A well-established series of steps must be developed and followed for delivering food and drinks to patients to ensure that it is done safely and in a way that maximizes the palatability of the food.

Meal transportation and distribution must be done carefully and rapidly to avoid the multiple risks of contamination and error associated with serving hot and individualized meals to a large number of patients. Depending on bed occupancy, 1–2 trained staff should be dedicated to organizing food intake (from kitchen or caterer) and distribution at least 3 times daily.<sup>1</sup>

Meal distribution is most efficient and safe when food arrival, assembly and transport into the high-risk zone occur according to a regular fixed schedule.

Food and drink must always be covered or wrapped during transport and must be delivered to patients in individual packaging or disposable containers.

A monitoring and feedback system must be in place, with irregularities recorded and reported to those in charge of the assembly and distribution system.

### **Packaging**

- Meals prepared offsite (catered) may be packaged individually at the site of preparation or arrive in bulk at the ETU.
- Meals, snacks or drinks that are prepared onsite or arrive at the ETU in bulk must be packaged and hygienically wrapped into individual portions at a tray assembly station.
- Containers and other packaging should be used to ensure that hot food remains hot/warm between preparation and delivery to the individual patients (which significantly increases palatability).
- Containers should be strong enough that food does not leak out when a patient eats it from their bed if they are not strong enough to eat at a table.<sup>1</sup>
- All containers with liquid should be sealed tightly to ensure that no liquid leaks during transportation.
- Plastic bags are often a good way to package liquids (water or soup). Use of small plastic bags with (cold) water, that only need piercing, have been reported as contributing favourably to adequate fluid intake.
- While paying attention to the hygiene of the containers used to serve food in, ensure that even weak patients can access and easily eat the food. For example, soup in plastic bags with tight knots may be too difficult to open for a patient with severe weakness.<sup>1</sup> These patients may then need assistance to safely and effectively open these bags at the bedside or wherever they eat.
- The use of individualized clamshell food containers/boxes with 2 to 3 compartments can be convenient for meal packaging.

- To ensure privacy, patient identification numbers or room numbers should be used rather than patient names.
- Meals should be labeled as “liquid”, “semi-solid” or “solid” to facilitate distribution.
- Utensils, if required, can be inserted directly into individual meal packages or left separately at the bedside.
- Snacks and drinks should have packaging that facilitates easy opening and consumption by the patient.
- 1.5 L water bottles should be avoided as they are too heavy for weaker patients; providing 0.5 or 0.75 L bottles is preferable.<sup>1</sup>
- If the ETU allows meals to be provided by family/friends of patients (see FAQ FS5), ensure they have received clear instructions regarding preparation (see FAQ 3) and packaging. Family should provide meals in clean and disposable material, carried in a plastic bag with the name of the patient. Food brought by family should subsequently be wrapped by ETU staff in another clean plastic bag at entry point (adding the room or patient identification number) before being further transported within the ETU to the patient.
- **NOTE:** ETU staff must not accept packages of food with any visible bodily fluids on them and must perform hand hygiene before and after handling any food packages from outside the ETU.

### **Transport and distribution**

The following should be considered during transportation of food to and within the ETU:

- Cooked food should be consumed within 2 hours of preparation given the high likelihood that it will be in the danger zone (5 to 60°C) during this period.<sup>2</sup> (Note: If the temperature of the food is kept above 60°C during transportation and serving, this period can be extended up to 4 hours; this is however unlikely to be the case in most ETU settings).
  - Cooked food should be transported immediately after preparation and should be 60°C or warmer at the start of transport.
  - If prepared offsite, transport of cooked food from the preparation site to the ETU entrance should take 30 minutes or less.
  - The time between arrival of food in the ETU to serving individual patients should be less than 30 minutes.
- The ETU should have a dedicated entrance for food and drinks.
- Food should never be left on the ground and should always be in the shade. In the ETU, prepared food should be placed on shelves/tables near the tray assembly station.

The following special considerations should be taken when transporting food from low-risk to high-risk zones:

- Food can enter the high-risk zone through a slide system or be carried in. When using a slide, the slope should be steep enough for packaged food to slide down easily with gravity, but not so steep that food and liquid can spill or fall to the ground (see photo). A stick can be used to facilitate movement of food and drinks down the slide.
- Items should NEVER be moved from the high-risk to the low-risk zone, except by infection prevention and control (IPC) teams.<sup>2</sup> Slides or other systems used to move food into the high-risk area should be ONE-WAY only (low-risk → high-risk).
- Items placed in the low-risk → high-risk transfer area or on the slide MUST be taken into the high-risk zone only.
- Ensure that all caretaker staff are informed when food arrives in the high-risk zone to avoid delays in consumption at bedside. If insufficient caretaker staff are onsite, ensure additional support staff are ready (in full personal protective equipment) to distribute meals and provide feeding to patients.<sup>3</sup>



Photo of slides used in an ETU for food provision from low-risk to high-risk zones. (Photo Credit: Mija Ververs)

## References

1. International Committee of the Red Cross (ICRC), Médecins Sans Frontières (MSF OCB/OCG). *Nutritional Protocol for Patients Infected with Ebola Virus Disease*. v 3.; 2016.
2. GOAL. *International Package of Tools and Protocols for Ebola Treatment Units*.; 2014.
3. Save the Children. *ETC Nutrition Protocol - Kerry Town Ebola Treatment Centre*. V2 ed.; 2015.



## **FAQ Food Systems 5. What instructions can be provided to families and friends who want to provide meals for an Ebola Treatment Unit (ETU) patient?**

In past Ebola outbreaks, some organizations have encouraged and actively promoted provision of meals by family and friends of patients to increase the likelihood that a patient would eat and help maintain a feeling of contact with normal life.<sup>1,2</sup> Familiar foods may indeed provide comfort for patients, if tolerated.

There are, however, challenges to accepting foods brought in from non-ETU sources. It is impossible to ensure whether basic food safety standards have been followed and more difficult to assure that the patient's dietary needs are met.

Each ETU must therefore evaluate the risks and benefits of this practice and decide whether accepting foods provided by family and friends is appropriate in the given context and for the individual patient.

An option may be to only accept food/drinks for certain patients (e.g., those who are not severely ill, have no significant electrolyte imbalances, are tolerating solid foods, and are convalescent) or to not accept meals containing certain 'high-risk' foods (e.g., no meat, no raw vegetables).

When family/friends are permitted to provide meals, a system must be in place to ensure that food hygiene is respected and that the food/drinks provided are in accordance with the patient's dietary needs. The system must include means for proper communication with staff and family/friends regarding the requirements, and steps to be taken from the moment food/drink is received until it reaches the patient's bedside.

Families/friends should receive guidance and instructions regarding:

- What type of diet to provide – including explanation of solid, semi-solid, or liquid diet.
- What types of foods to provide – noting the need for energy-dense, highly digestible foods, and any other specific dietary requirements the patient may have.
- Basic food hygiene practices to be followed during preparation (see FAQ FS3).
- How to package individual meals (see FAQ FS4).

**NOTE:** ETU staff must not accept packages of food with any visible bodily fluids on them and must perform hand hygiene before and after handling any food packages from outside the ETU.

**Annex 1. Suggestions for families/friends wishing to provide meals for an ETU patient<sup>3</sup>**

**TYPE OF MEAL:**

- ❑ **Solid diet** (for patients with good appetite and no difficulty with eating) – standard food provided; large solid pieces may need to be cut into small pieces if the patient is too weak to cut.
- ❑ **Semi-solid diet** (for patients with moderate appetite and/or difficulty with eating) – food must be soft and easy to swallow without chewing; standard food can often be used, though some items may need to be pureed
- ❑ **Liquid diet** (for patients with poor appetite and extreme difficulty eating) – food must be drinkable.

**SUGGESTIONS FOR WHAT TO BRING (ADAPT ACCORDING TO TYPE OF MEAL)**

- ❑ **Fresh coconut water**



- ❑ **Family meal or soup with foods from the following categories:**

- Starchy foods (rice, millet, potatoes, cassava, yam tubers, sweet potatoes, etc.)



- Vegetables (zucchini, eggplant, carrots, green leaves, pumpkin, etc.)



- Protein of vegetable (dry beans, peas, lentils – soaked overnight and well cooked) or animal-source foods (eggs, fish, poultry, meat) with no bones.



- ❑ **Porridge** from rice, maize, millet or other mixed with sugar, milk or vegetables.



Note: Family meals and porridges can be enriched with 1 tablespoon of oil if not used for preparation.

- ❑ **Snacks** (bananas/plantains, avocado, mango, baobab fruit, dry dates and figs, nuts, etc.)



## References

1. Médecins Sans Frontières (MSF). *2018 Filovirus Disease Guidelines - Draft, Appendix X: Nutritional Tools for Patients Infected with Filovirus Disease.*; 2018.
2. World Health Organization. *Optimized Supportive Care for Ebola Virus Disease: Clinical Management Standard Operating Procedures.* World Health Organization; 2019.
3. International Committee of the Red Cross (ICRC), Médecins Sans Frontières (MSF OCB/OCG). *Nutritional Protocol for Patients Infected with Ebola Virus Disease.* v 3.; 2016.

## References for ETU Nutritional Care FAQs<sup>1-67</sup>

1. Aluisio AR, Perera SM, Yam D, et al. Vitamin A Supplementation Was Associated with Reduced Mortality in Patients with Ebola Virus Disease during the West African Outbreak. *J Nutr*. 2019;149(10):1757-1765. doi:10.1093/jn/nxz142
2. Bayraktar Ekincioglu A, Demirkan K. Clinical nutrition and drug interactions. *Turk J Surg*. 2014;29(4):177-186. doi:10.5152/UCD.2013.112013
3. Boullata JI. Enteral Medication for the Tube-Fed Patient: Making This Route Safe and Effective. *Nutr Clin Pract*. 2021;36(1):111-132. doi:10.1002/ncp.10615
4. Bushra R, Aslam N, Khan AY. Food-Drug Interactions. *Oman Med J*. 2011;26(2):77-83. doi:10.5001/omj.2011.21
5. CDC. Infant Formula Preparation and Storage. Centers for Disease Control and Prevention. Published July 13, 2022. <https://www.cdc.gov/nutrition/infantandtoddlernutrition/formula-feeding/infant-formula-preparation-and-storage.html>
6. Codex Alimentarius Commission, Joint FAO WHO Food Standards Programme, eds. *Food Hygiene: Basic Texts ; Codex Alimentarius*. 4. ed. FAO [u.a.]; 2009.
7. Dixit D, Masumbuko Claude K, Kjalldgaard L, Hawkes MT. Review of Ebola virus disease in children – how far have we come? *Paediatr Int Child Health*. 2021;41(1):12-27. doi:10.1080/20469047.2020.1805260
8. Gilbert S, Hatton J, Magnuson B. How to Minimize Interaction Between Phenytoin and Enteral Feedings: Two Approaches. *Nutr Clin Pract*. 1996;11(1):28-31. doi:10.1177/011542659601100128
9. GOAL. *International Package of Tools and Protocols for Ebola Treatment Units.*; 2014.
10. Government of Sierra Leone. *Sierra Leone Emergency Management Program Standard Operating Procedure for Food Distribution to Quarantined Households, Holding and Treatment Centers - Sierra Leone Emergency Management Program Standard Operating Procedure for Nutritional Support*. Version 1.; 2014.
11. <https://doh.sd.gov/documents/Food/Checklist.pdf> (Accessed 4 August 2021).
12. International Committee of the Red Cross (ICRC). *Nutrition Care Protocols for Ebola Virus Disease (EVD) Patients - Liberia Experience*. Draft version 9.; 2015.
13. International Committee of the Red Cross (ICRC), Médecins Sans Frontières (MSF OCB/OCG). *Nutritional Protocol for Patients Infected with Ebola Virus Disease*. v 3.; 2016.
14. International Federation of the Red Cross (IFRC). *Ebola Treatment Center Standard Operating Procedures.*; 2015.
15. International Medical Corps (IMC). *Nutrition Guidelines for Ebola Treatment Centers.*; 2014.
16. Johnson DW, Sullivan JN, Piquette CA, et al. Lessons Learned: Critical Care Management of Patients With Ebola in the United States\*. *Crit Care Med*. 2015;43(6):1157-1164. doi:10.1097/CCM.0000000000000935
17. Kodish SR, Rohner F, Beauliere JM, et al. Implications of the Ebola virus disease outbreak in Guinea: Qualitative findings to inform future health and nutrition-related responses. McDermid JM, ed. *PLOS ONE*. 2018;13(8):e0202468. doi:10.1371/journal.pone.0202468

18. Kreuels B, Wichmann D, Emmerich P, et al. A Case of Severe Ebola Virus Infection Complicated by Gram-Negative Septicemia. *N Engl J Med*. 2014;371(25):2394-2401. doi:10.1056/NEJMoa1411677
19. Lyon GM, Mehta AK, Varkey JB, et al. Clinical care of two patients with Ebola virus disease in the United States. *N Engl J Med*. 2014;371(25):2402-2409. doi:10.1056/NEJMoa1409838
20. Magnuson BL, Clifford TM, Hoskins LA, Bernard AC. Enteral Nutrition and Drug Administration, Interactions, and Complications. *Nutr Clin Pract*. 2005;20(6):618-624. doi:10.1177/0115426505020006618
21. McClave SA, Taylor BE, Martindale RG, et al. Guidelines for the Provision and Assessment of Nutrition Support Therapy in the Adult Critically Ill Patient: Society of Critical Care Medicine (SCCM) and American Society for Parenteral and Enteral Nutrition (A.S.P.E.N.). *JPEN J Parenter Enteral Nutr*. 2016;40(2):159-211. doi:10.1177/0148607115621863
22. Médecins Sans Frontières (MSF). *2018 Filovirus Disease Guidelines - Draft, Appendix X: Nutritional Tools for Patients Infected with Filovirus Disease.*; 2018.
23. Medina-Rivera M, Centeno-Tablante E, Finkelstein JL, et al. Presence of Ebola virus in breast milk and risk of mother-to-child transmission: synthesis of evidence. *Ann N Y Acad Sci*. 2021;1488(1):33-43. doi:10.1111/nyas.14519
24. Mehta NM, Skillman HE, Irving SY, et al. Guidelines for the Provision and Assessment of Nutrition Support Therapy in the Pediatric Critically Ill Patient: Society of Critical Care Medicine and American Society for Parenteral and Enteral Nutrition. *Pediatr Crit Care Med J Soc Crit Care Med World Fed Pediatr Intensive Crit Care Soc*. 2017;18(7):675-715. doi:10.1097/PCC.0000000000001134
25. Ministry of Health and Social Welfare, Republic of Liberia. *Updated Guideline on Infant and Young Child Feeding in an Emergency - Guideline in the Context of Ebola Virus Disease Outbreak in Affected Counties of Liberia.*; 2014.
26. Ministry of Health and Social Welfare, Republic of Liberia. *Guidelines on Nutritional Care and Support for EVD Patients in Treatment Units and Care Centers - A Practical Guide for Implementing Agencies Involved in the Management and Treatment of EVD in Liberia.*; 2014.
27. Mohammed H, Vandy AO, Stretch R, et al. Sequelae and Other Conditions in Ebola Virus Disease Survivors, Sierra Leone, 2015. *Emerg Infect Dis*. 2017;23(1):66-73. doi:10.3201/eid2301.160631
28. MSc JS, MRPharmS, Campbell H, et al. Parenteral nutrition in adults: the basics. *The Pharmaceutical Journal*. <https://pharmaceutical-journal.com/article/ld/parenteral-nutrition-in-adults-the-basics>
29. Nyhus Dhillon C, Sarkar D, Klemm RD, et al. Executive summary for the Micronutrient Powders Consultation: Lessons Learned for Operational Guidance. *Matern Child Nutr*. 2017;13 Suppl 1(Suppl 1):e12493. doi:10.1111/mcn.12493
30. Partners in Health (PIH). *Nutritional Care for Patients at Maforki Ebola Holding and Treatment Center*. Version 2.2.; 2015.
31. République Démocratique du Congo, Ministère de la Santé, Programme National de Nutrition (PRONANUT), with support from UNICEF and the WHO. *Strategie Conjointe de Prise En Charge Nutritionnelle et Alimentaire Dans Le Cadre de La Reponse a l'Epidemie de Maladie a Virus Ebola Dans Les Zones de Sante de Bikoro, Iboko, Ntondo, Mbandaka et Wanganta a l'Equateur, RDC.*; 2018.
32. République Démocratique du Congo, Ministère de la Santé, Programme National de Nutrition (PRONANUT), with support from UNICEF. *Protocole de Soins Nutritionnels Chez Le Adultes et Les Enfants Avec Maladie a Virus Ebola (MVE) Hospitalisés Aux Centres de Traitement (CTE).*; 2018.

33. République Démocratique du Congo, Ministère de la Santé, Programme National de Nutrition (PRONANUT), with support from UNICEF. *Manuel d'Orientation Sur La Promotion, La Protection et Le Soutien a l'Alimentation Du Nourisson et Du Jeune Enfant En Communauté Dans Le Contexte de l'Epidémie de La Maladie a Virus Ebola a l'Est de La Republique Democratique Du Congo.*; 2019.
34. République Démocratique du Congo, Ministère de la Santé, Programme National de Nutrition (PRONANUT), with support from UNICEF. *Protocole de Soins Nutritionnels Dans Le Contexte de La Maladie a Virus Ebola and Republique Democratique Du Congo.*; 2019.
35. Save the Children. *ETC Nutrition Protocol - Kerry Town Ebola Treatment Centre.* V2 ed.; 2015.
36. Smit MA, Michelow IC, Glavis-Bloom J, Wolfman V, Levine AC. Characteristics and Outcomes of Pediatric Patients With Ebola Virus Disease Admitted to Treatment Units in Liberia and Sierra Leone: A Retrospective Cohort Study. *Clin Infect Dis Off Publ Infect Dis Soc Am.* 2017;64(3):243-249. doi:10.1093/cid/ciw725
37. Stadlmayr B, Charrondiere UR, Enujiugha VN, Bayili RG, Fagbohoun EG, Samb B et al. *West African Food Composition Table.* Food and Agriculture Organization of the United Nation; 2012. [www.fao.org/docrep/015/i2698b/i2698b00.pdf](http://www.fao.org/docrep/015/i2698b/i2698b00.pdf)
38. te Loo DM, van der Graaf F, Ten WTA. The effect of flavoring oral rehydration solution on its composition and palatability. *J Pediatr Gastroenterol Nutr.* 2004;39(5):545-548. doi:10.1097/00005176-200411000-00018
39. UNICEF. Food and nutrition component of direct EVD Response – Liberia, Guinea, Sierra Leone. Presented at: unknown.
40. Uyeki TM, Mehta AK, Davey RT, et al. Clinical Management of Ebola Virus Disease in the United States and Europe. *N Engl J Med.* 2016;374(7):636-646. doi:10.1056/NEJMoa1504874
41. Uyeki TM, Mehta AK, Davey RTJ, et al. Clinical Management of Ebola Virus Disease in the United States and Europe. *N Engl J Med.* 2016;374(7):636-646. doi:10.1056/NEJMoa1504874
42. van Griensven J, Bah EI, Haba N, et al. Electrolyte and Metabolic Disturbances in Ebola Patients during a Clinical Trial, Guinea, 2015. *Emerg Infect Dis.* 2016;22(12). doi:10.3201/eid2212.161136
43. Ververs M, Anantharam P. Nutritional Care For Patients With Ebola Virus Disease In Ebola Treatment Units: Past And Current Experiences. *US Dep Health Hum Serv Cent Dis Control Prev.* Published online August 26, 2019:28.
44. Ververs M, Arya A. Ebola virus disease and breastfeeding: time for attention. *The Lancet.* 2019;394(10201):825. doi:10.1016/S0140-6736(19)32005-7
45. Ververs M, Gabra M. Nutritional Care for Patients with Ebola Virus Disease. *Emerg Infect Dis.* 2020;26(1):20-25. doi:10.3201/eid2601.191024
46. Ververs M, Vorfeld C. Guidance materials from 2014 to 2019 on nutritional care for Ebola patients in Ebola Treatment Units: an analysis. *Public Health Nutr.* 2021;24(1):139-145. doi:10.1017/S136898002000261X
47. Ververs MT, Antierens A, Sackl A, Staderini N, Captier V. Which anthropometric indicators identify a pregnant woman as acutely malnourished and predict adverse birth outcomes in the humanitarian context? *PLoS Curr.* 2013;5:ecurrents.dis.54a8b618c1bc031ea140e3f2934599c8. doi:10.1371/currents.dis.54a8b618c1bc031ea140e3f2934599c8

48. WHO, Ministry of Health DRC, UNICEF (2019). Ebola Nutrition Lesson Learning Workshop – 13th to 16th May 20219, Goma DRC.
49. World Health Organization. Five keys to safer foods manual. Published online 2006.
50. World Health Organization. *Clinical Management of Patients with Viral Haemorrhagic Fever: A Pocket Guide for Front-Line Health Workers: Interim Emergency Guidance for Country Adaptation*. World Health Organization; 2016.
51. World Health Organization. *Optimized Supportive Care for Ebola Virus Disease: Clinical Management Standard Operating Procedures*. World Health Organization; 2019.
52. World Health Organization. *Guidelines for the Management of Pregnant and Breastfeeding Women in the Context of Ebola Virus Disease*. World Health Organization; 2020.
53. World Health Organization, World Food Programme, United Nations Children’s Fund (UNICEF). *Interim Guideline: Nutritional Care of Children and Adults with Ebola Virus Disease in Treatment Centres*. World Health Organization; 2014.
54. Yam D, Aluisio AR, Perera SM, et al. Association between multivitamin supplementation and mortality among patients with Ebola virus disease: An international multisite cohort study. *Afr J Emerg Med Rev Afr Med Urgence*. 2020;10(1):23-29. doi:10.1016/j.afjem.2019.11.001
55. A Case of Severe Ebola Virus Infection Complicated by Gram-Negative Septicemia | NEJM. [https://www.nejm.org/doi/10.1056/NEJMoa1411677?url\\_ver=Z39.88-2003&rfr\\_id=ori:rid:crossref.org&rfr\\_dat=cr\\_pub%20%20www.ncbi.nlm.nih.gov](https://www.nejm.org/doi/10.1056/NEJMoa1411677?url_ver=Z39.88-2003&rfr_id=ori:rid:crossref.org&rfr_dat=cr_pub%20%20www.ncbi.nlm.nih.gov)
56. A Guide to Calcium-Rich Foods. Bone Health & Osteoporosis Foundation. <https://www.bonehealthandosteoporosis.org/patients/treatment/calciumvitamin-d/a-guide-to-calcium-rich-foods/>
57. Ensure\_TwoCal\_datasheet\_226KB.pdf. Accessed November 30, 2022. [https://static-nocdn.abbottnutrition.com/cms/preview/abbottnutrition-2016.com/img/Ensure\\_TwoCal\\_datasheet\\_226KB.pdf](https://static-nocdn.abbottnutrition.com/cms/preview/abbottnutrition-2016.com/img/Ensure_TwoCal_datasheet_226KB.pdf)
58. Enteral Medication for the Tube-Fed Patient: Making This Route Safe and Effective - Boullata - 2021 - Nutrition in Clinical Practice - Wiley Online Library. Accessed December 1, 2022. <https://aspenjournals.onlinelibrary.wiley.com/doi/10.1002/ncp.10615>
59. Food Bacteria - What Temperature Kills Bacteria in Food? Accessed October 13, 2022. <https://www.fooddocs.com/post/what-temperature-kills-bacteria-in-food>
60. Fruit Juices as Perpetrators of Drug Interactions: The Role of Organic Anion-Transporting Polypeptides - Dolton - 2012 - Clinical Pharmacology & Therapeutics - Wiley Online Library. Accessed December 1, 2022. <https://ascpt.onlinelibrary.wiley.com/doi/10.1038/clpt.2012.159>
61. Peptamen® Vanilla Liquid Sip Feed | Nestlé Health Science. <https://www.nestlehealthscience.co.uk/brands/peptamen/peptamen-vanilla-bottles#:~:text=Shelf%20life%209%20months%20from%20date%20of%20manufacture.>
62. Ranitidine Hydrochloride Capsules and Tablets (ranitidine hydrochloride) dose, indications, adverse effects, interactions... from PDR.net. <https://www.pdr.net/drug-summary/Ranitidine-Hydrochloride-Capsules-and-Tablets-ranitidine-hydrochloride-2965>

63. Sexton, J., Campbell, H., Turner, P. & Rahman, M. (2009). Parenteral nutrition in adults: the basics. The Pharmaceutical Journal. Published online: September 2009.
64. UHT Milk: What is Ultra-High Temperature Milk? <https://www.usdairy.com/news-articles/uht-milk-what-is-ultra-high-temperature-milk>
65. West African Food Composition Table - Table de composition des aliments d'Afrique de l'Ouest. :171.
66. Vitamins and minerals - Calcium. nhs.uk. Published October 23, 2017. <https://www.nhs.uk/conditions/vitamins-and-minerals/calcium/>
67. Outbreaks | Ebola (Ebola Virus Disease) | CDC. Published November 2021. <https://www.cdc.gov/vhf/ebola/outbreaks/index-2018.html>