INFANT FEEDINGS: THE FORGOTTEN PATIENT SAFETY RISK

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Background

Many may consider centralized handling of infant feedings within the healthcare setting a novel and progressive approach. However, the use of a centralized room for the preparation of infant feedings is not a new concept. The 1936 textbook *Essentials of Pediatrics for Nurses* included an entire section on “The Hospital Milk Room,” which described the importance of having a location where infant feedings can be prepared in a satisfactory manner and indicated that the space should be a separate room with no other purpose or function. The authors discussed the importance of using “clean” technique at all times and methods of preventing contamination. Furthermore, the publication stressed the importance of preparation accuracy (such as use of an appropriate scale for weighing powdered ingredients and precise calculation of recipes) and offered detailed advice on equipment and staffing needs. Nonetheless, over 80 years later, many hospitals have yet to implement such practices.

In the modern era, the Pediatric Nutrition Practice Group (PNPG) of the Academy of Nutrition and Dietetics (formerly the American Dietetic Association) brought this topic to the forefront with a series of four publications between 1991-2018 designed to outline best practices:


In addition, over the past two decades, other professional organizations have published recommendations on best practices while individual healthcare facilities have published original research on their own quality improvement initiatives regarding handling of infant feedings.

To obtain 1.5 CPEU for Registered Dietitians or 1.0 CE credit for nurses, please read this article and follow the links to answer the knowledge check questions in their entirety.

After reading this article, the learner will be able to:

1. List the three primary concerns with handling of infant feedings in the hospital setting.
2. Describe current best practices and be able to locate resources available.
3. List the proper storage times and temperatures for human milk and formulas.
4. Create a basic HACCP plan for the handling of infant feedings.
Infant Feeding Handling Risks

The importance of proper handling of infant feedings within the healthcare setting is well-documented. Premature and hospitalized infants often have complex nutritional needs necessitating individualized feeding regimens that require the fortification of human milk or preparation of formula to modify the nutrient density. Primary concerns with the preparation, handling, and administration of feedings include preparation errors, contamination, and misadministration (providing the wrong human milk or wrong formula to a patient)—all of which pose safety concerns and could result in serious adverse effects.1

Contamination of infant feedings may occur at any step of the process if aseptic technique is not diligently followed. Case reports of sepsis linked to improperly sanitized breast pump parts have been documented in the literature.2 Centralized formula preparation has been shown to decrease the presence of any microbial growth in facility-prepared powdered formulas from 43.7% to 4%.3 Hospitals using human milk bar code scanning have found that errors were more frequent than what was anticipated to be the use of such technology, with published data showing 110 to 598 wrong milk scans and from 254 to 6,045 expired milk scans annually per facility.4,5

Best Practices

Best practices to address these primary concerns include the use of:6-10,16

- Centralized preparation of feedings in a designated location used for the sole purpose of human milk and formula preparation
- Use of technology to ensure accuracy of orders and recipes:
  - Systems that alert for inappropriate orders (such as alerting when a formula for a child over one year of age is ordered for an infant)
  - Systems that automatically calculate recipes based on the feeding order
- Use of bar code scanning technology to prevent misadministration at each point in the process, including use of systems to ensure that the correct:
  - Human milk, fortifiers, modifiers and/or formulas are used during preparation

Staff Competency

Facilities may differ as to which staff are tasked with preparing infant feedings, ranging from the bedside nurse to support staff to dedicated technicians. Regardless of job title, all staff participating in feeding preparation should have annual competency validation to ensure proper technique. Required skills include:12

- Hand hygiene and aseptic technique
- Proper use of measuring equipment (such as gram scales, graduated cylinders and syringes)
- Determination of expiration dates/times of storage human milk, prepared feedings and products (formulas, fortifiers and modifiers)

Recommended Storage Times

- Refrigerator (≤4°C, ≤39°F)
- Freezer (home unit combined with refrigerator: <-18°C, <0°F)

A refrigerator, work counter, storage facilities and hands-free handwashing station are required.

- A separate cleanup area for washing and sanitizing is required if any reusable preparation equipment is used. The total square footage dedicated to infant feeding preparation will depend on several factors, including number of patients served, volume of feedings prepared, complexity of feeding orders and technologies employed (such as bar code scanning or a breast milk analyzer). The size of the preparation room must account for the number of refrigerators and freezers (either in or adjacent to the preparation area) needed for both long-term storage of human milk as well as short-term storage of prepared feedings.5

Sanitation

Hand hygiene and attention to aseptic technique during infant-feeding preparation are crucial for patient safety. Although commonly used interchangeably, aseptic technique is not the same as sterile technique.13,14 While sterile technique eliminates all microorganisms, aseptic technique aims to minimize the presence of pathogenic microorganisms and is typically the level of sanitation appropriate for infant feeding preparation.15 Hand hygiene, proper sanitation of work surfaces before and between each feeding preparation, and cleaning/disinfection of any reusable items are the aspects that reduce risk of transferring pathogens between patients.15-19

Recently, the novel coronavirus has brought focus on sanitation and hand hygiene to the general public; however, other viruses could be transferred with poor handling techniques.20-22 Most hospitals do not routinely test for all potential viruses (including enteric and other respiratory viruses) and many hands may touch bottles that are being transported from home to the hospital; therefore, it is reasonable to make the assumption that the outside of any bottle could easily become contaminated.23 However, the use of chemical sanitizers to wipe down the outside of bottles has been noted as unnecessary and potentially unsafe by the Human Milk Banking Association of North America (HMBANA).24 Bottles should instead be handled to prevent transfer of any potential microorganisms from the outside of the bottle to the contents.25

Use of the Hazard Analysis Critical Control Point (HACCP) system is beneficial in identifying critical control points (CCPs) where contamination may be introduced in the infant feeding preparation process.26 These CCPs may then be monitored and a plan implemented to prevent contamination. A multi-disciplinary HACCP team is beneficial in designing the plan, monitoring methods, corrective actions and responsible individuals.27

Storage of Human Milk and Prepared Feedings

Proper storage times and temperatures are critical to reduce risk of microbial growth and promote patient safety.28-30 Recommendations within the healthcare setting are geared toward the preterm, ill, and/or immunocompromised infant and, therefore, tend to be more conservative than guidelines for the healthy infant at home.31,32,33 Storage guidelines are as follows:5,16,21

- Risk of microbial growth as well as potential changes to HM composition may occur over time.21,27 While the optimal length of time between preparation and feeding of fortified HM is unknown, the recommendation for a 24-hour maximum storage time after fortification regardless of whether fresh HM or previously frozen, thawed HM is used is supported by current research.34,35,36

With centralized handling, the maximum storage time may account for total time required for feeding preparation, transport to the patient/unit and storage time before feeding. In other words, the total time from when the first feeding is prepared to when it is finally consumed must fall within 24 hours.

Feeding Type

<table>
<thead>
<tr>
<th>Feeding Type</th>
<th>Storage Conditions</th>
<th>Recommended Storage Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human Milk</td>
<td></td>
<td></td>
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<tr>
<td>Fresh Human Milk (HM)</td>
<td>Room temperature (20°C–25°C, 68°F–77°F)</td>
<td>48 hours</td>
</tr>
<tr>
<td></td>
<td>Colder with ice packs (15°C, 59°F)</td>
<td>24 hours</td>
</tr>
<tr>
<td></td>
<td>Refrigerator (≤4°C, ≤39°F)</td>
<td>48 hours*</td>
</tr>
<tr>
<td>Thawed HM</td>
<td>Refrigerator (≤4°C, ≤39°F)</td>
<td>24 hours</td>
</tr>
<tr>
<td>Thawed pasteurized donor HM (DHM)</td>
<td>Refrigerator (≤4°C, ≤39°F)</td>
<td>48 hours</td>
</tr>
<tr>
<td>Fortified HM or DHM (fresh or thawed)</td>
<td>Refrigerator (≤4°C, ≤39°F)</td>
<td>24 hours</td>
</tr>
<tr>
<td>Frozen HM</td>
<td>Freezer (home unit combined with refrigerator: −18°C, −0°F)</td>
<td>3–6 months</td>
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<tr>
<td></td>
<td>Freezer (−20°C, −4°F)</td>
<td>6–12 months</td>
</tr>
<tr>
<td></td>
<td>Freezer (−70°C to −80°C, −94°F to −−112°F)</td>
<td>12 months +</td>
</tr>
</tbody>
</table>

* While there has been discussion around longer storage times for fresh HM in the refrigerator, the recommended maximum of 48 hours is appropriate for most healthcare facilities to minimize risk. Two 1-hour storage times (between preparation and feeding) is important to ensure optimal handling and storage throughout the process, including transport to the patient/unit and before feeding. Bacterial survival is the primary concern with proper handling of both HM and infant formulas. However, it may not be held potentially lethal (bacterial) infection. It may not be warranted to extend beyond 24 hours even if the other conditions are met beyond.21

Formula

- Refrigerator (≤4°C, ≤39°F) | 24 hours |

Commercially Sterile Ready-to-Feed Formulas (after opening)

- Refrigerator (≤4°C, ≤39°F) | 24 hours |
Overall Processes


- Considered by many clinicians and surgeons as the definitive resource for handling of infant and pediatric feedings
- Contains practical guidelines based on current research, scientific evidence and expert consensus
- Latest edition includes new chapters addressing the following infant feeding topics:
  - Getting Started
  - Lactoengineering
  - Donor Human Milk, Human Milk Products and Milk Sharing
  - Modulars and Other Additives


- Includes recommendations for best practices at each step of the process from initial patient assessment, feeding orders, product selection, preparation, labeling and administration
- Provides background, practice recommendations, rationale, topics for future research and references for each area addressed


- Includes recommendations for best practices at each step of the process from initial patient assessment, feeding orders, product selection, preparation, labeling and administration
- Provides a multi-disciplinary perspective on step-by-step techniques, monitoring patients, complications and home enteral nutrition

Implementing Best Practices: Tools and Resources

Whether implementing a brand-new infant feeding handling program or improving on current processes, putting research and published recommendations into actual day-to-day practice can be daunting. However, the benefits to patient care make it well worth the effort! The key to success is tapping into existing tools and resources and knowing where to turn for information.

Space Planning

Facility Guidelines Institute (FGI).
https://fgi.guidelines.org/

Knowledge check!

Access the FGI guidelines via the link above. Under the “Guide” section, select “Adoption of the FGI Guidelines.” Find your state on the map and see if it adopts the FGI guidelines officially or if your state has its own regulations.

Sanitation

Centers for Disease Control and Prevention.
https://www.cdc.gov/handwashing/

Knowledge check!

Review the CDC handwashing guidelines from the link above and the “Read the Science Behind the Recommendations” link within the webpage and answer the following:

1. List the five steps for correct handwashing.
2. Is hot water necessary to eliminate pathogens during handwashing?

Association for Professionals in Infection Control and Epidemiology.
Guide to hand hygiene programs for infection prevention, 2015.
http://www.apic.org/Professional-Practice/Implementa tion-guides/HandHygiene

http://apps.who.int/iris/bitstream/10665/70126/1/WHO_HER_ PSP_2009_1.pdf

Knowledge check!

Review the WHO guidelines from the link above and the next questions:

1. What are the seven HACCP Principles.
2. List the five Preliminary Tasks in the Development of a HACCP Plan.
3. When would an FMEA be performed?

https://www.fda.gov/guidanceregulation/retailfoodprotection/foodcode/ucm595139.htm

Knowledge check!

Review the 2017 FDA Food Code. In the document Preface section, there are five major risk factors related to employee behaviors and preparation practices that contribute to foodborne illness. Which of these five are most relevant to the preparation and handling of human milk and infant formula?

https://www.fda.gov/guidance-regulation/haccp

Knowledge check!

Review the HACCP guidelines from the link above and answer the following:

1. HACCP is a management system in which food safety is addressed through the analysis and control of biological, chemical, and hazards from raw material procurement through consumption of the finished product.
2. Name the seven HACCP Principles.
3. List the five Preliminary Tasks in the Development of a HACCP Plan.

Click here for an example of one hospital’s HACCP plan for human milk.

Centers for Disease Control and Prevention.
https://www.cdc.gov/healthywater/hy giene/healthy/hilkicare/infantrfeeding/ breastpump.html

Knowledge check!

Review the CDC breast pump kit cleaning guidelines from the link above and answer the following:

1. Sanitizing the pump kit is especially important for which three infant populations?
2. List two methods of sanitizing breast pump kit parts.
Critical Thinking Evaluation Tool for Self-Study Programs

1. Did you find the education valuable? If yes, what aspects of the education was valuable? If no, why not? 

2. Did you or will you change your practice(s) based on what you learned in the program? If yes, what change do you intend to make? If no, why not? 

3. What barriers or limitations do you anticipate when trying to implement this new information into your practice? 

4a. What are the strengths and limitations of the information presented? 

4b. What are the identified gaps in the information provided? (Ex. outcomes that apply to a specific patient/client population; limited data in gender, age, other races, etc.) 

References