GUIDELINES ON THE HANG TIME OF ENTERAL FEEDS AND INFUSION EQUIPMENT (PLASTICS) FOR INPATIENTS IN OLCHC.

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DOCUMENT REVIEW HISTORY

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1.0 DOCUMENT & GUIDELINE PURPOSE

Document Purpose. The development of suitable guidance material on the handling of feeds and feeding equipment on the wards.

Guideline Purpose. These guidelines aim to minimise the risk of acquiring infection from enteral feeds for this vulnerable group of patients.

2.0 INTRODUCTION

Sick children are at nutritional risk and it is important that they receive appropriate nutritional intake to meet requirements. It is generally accepted that whenever possible, Enteral Nutrition (EN) is preferable to Parenteral Nutrition (PN) for adult and paediatric patients (De Oliveira Iglesias et al, 2007).

EN has many documented advantages, including improving the digestive, absorptive, immunological and nutritional status of the patient. However enteral feeding is not without risks. Such risks include nosocomial infections (e.g. pneumonia, bacteremia, diarrhoea, and infectious enterocolitis) being linked to contaminated formulas or infusion sets (Casewell et al 1981, Levy et al 1989, Jacobs et al 1990, Navajas et al 1992, Okuma et al 2000, Himelright et al, 2002). These risks are exacerbated in critically ill children as many are immunocompromised (Grant, 2001).

Contamination of enteral feeds with micro-organisms can occur at any point throughout their production, preparation, storage or administration. Manipulation of the feed and the hang time of feeds and feeding sets contribute to the microbial load (Casewell et al, 1981). Enteral feedings can be given intermittently, as bolus feeds or continuously via a pump over longer periods. There are considerable variations in hang time recommendations throughout the literature with few studies conducted in the paediatric setting.

Powdered Infant Formula (PIF) contaminated with harmful bacteria has been implicated as a source of illness in infants. In recent years, the emergence of disease associated with the bacterium Enterobacter sakazakii in PIF has necessitated a new risk assessment. Many in-patients will receive PIF while a large proportion of patients will receive ready to feed formula and sterile pack feeds.

Open Enteral System: PIF, Other Reconstituted Powdered Feeds and Ready to Feed Liquid Formulæ are initially all decanted into a feeding reservoir and infused via giving sets into a feeding tube (e.g. nasogastric, nasojejunal, gastrostomy). This is known as an open enteral system.

Closed Enteral System: Sterile Pre Filled Pack Feeds can be attached directly to a giving set and are ready to administer. This system is referred to as a closed system.

Foodborne diseases can affect all age groups in the population, however the following groups have been identified as higher risk groups based on international risk assessment (FAO/WHO, 2006):

Vulnerable group: All infants <12months of age
Most Vulnerable Group: All infants <2months of age and all immunocompromised children irrespective of age.

It is imperative that guidelines are developed on enteral feed hang times to assist all staff involved with the delivery of EN. The American Dietetic Association (ADA) recommend that a policy for hang time for formulas and feeding sets must be established locally for each facility (ADA, 2003).
3.0 COMPLICATIONS ASSOCIATED WITH ENTERAL FEEDING

- Microbial Contamination of feed and giving set
- Nosocomial Infections

4.0 EQUIPMENT

- Reservoirs: Nutricia™ 0.5litre Flocare (Rigid) Container, 1litre Flocare (Rigid) containers, 1.3 Litre Flocare Top Fill Reservoir. Will be referred to as feeding reservoirs throughout this document.
- Enteral feeding: Nutricia™ Flocare Infinity Pack Giving Sets. Will be referred to as feeding giving set throughout this document.
- Syringes used for Reservoir Gravity Feeding and tubing
5.0 PROCEDURE

See separate sections below for different types of feeds (5.1 – 5.6 inclusive)

<table>
<thead>
<tr>
<th>ACTION</th>
<th>RATIONALE &amp; REFERENCE</th>
</tr>
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</table>
| 5.1 Powdered Infant Formulae (PIF) and Reconstituted Powdered Feeds | *PIF and Reconstituted Powdered Feeds are non sterile. This means that the feed may occasionally contain pathogens that can cause serious illness.*  
*Salmonella enterica and Enterobacter sakazakii are the two organisms present in PIF with a demonstrated causality of illness in infants and therefore of most concern (FAO/WHO, 2006).*  
The temperature of the ward will also affect the temperature of the feed. Bacteria will grow once feeds reach a temperature above 4°C (Food Safety Authority of Ireland, FSAI, 2007). It is therefore necessary to restrict the time that the feed is in this temperature range.  
When feeds reach this temperature (>4°C) bacteria could grow to sufficient numbers in the feed to cause illness and increase the risk of nosocomial infections (FSAI, 2007).  
The feeding set is sterile at the start of feeding but after 2 hours fat and protein deposits will build up on the feeding equipment. Bacteria that may be present in the feed could adhere to these deposits and grow forming a sticky layer (biofilm) that can develop in time into growing communities of bacteria. If fresh feed is then put into the previously used equipment then the new feed will be contaminated with bacteria. (Anderton 1995, FSAI 2007).  
It is worth noting that build up of these biofilms can be extremely difficult to remove during cleaning if equipment is reused. Consequently, it is safer to use clean and sterile feeding equipment for each fresh feed (Anderton, 1999).  
Setting the maximum hang time at 4 hours is a compromise between practicality and the time within which bacteria could grow. The FSAI have recommended restricting hang times to 2 hours (FSAI, 2007). The consensus for inpatients has been to restrict hang times for PIF (feeds and equipment) to 4 hours as changing feeds and sets any more frequently than this would not be feasible economically or practically on the units. This concurs with ICNA 2003 guidelines, Crest 2004 Guidelines, ASPEN 2009 and the American Dietetic Association Guidelines. |
| The feeding giving set and feeding reservoir must be changed every 4 hours when infusing PIF. | *Rationale to prevent contamination of feeds with bacteria.*  
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*Salmonella enterica and Enterobacter sakazakii are the two organisms present in PIF with a demonstrated causality of illness in infants and therefore of most concern (FAO/WHO, 2006).*  
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### 5.2 Ready to Feed Liquid Formula (decanted from a bottle or tetra pack)

Ready to Feed Liquid Formulae must be used within 4 hours of removal from fridge. Always check the label and expiry date on bottle before using. **The feeding giving set and feeding reservoir** must be changed every 4 hours when infusing Ready to Feed Liquid Formulae.

**Rationale to prevent contamination of feeds with bacteria.**
- Ready to Feed Liquid formula is subjected to a heat process by the manufacturer that is sufficient to kill *E. sakazakii* and any other bacteria that can be harmful (FSAI, 2007).
- When these feeds are decanted from their containers, their sterility is decreased and therefore they become non-sterile (Anderton, 1995).
- These feeds will equilibrate with ambient temperature which can increase bacterial growth leading to gastro-intestinal illness in the child. Therefore a maximum hang time of 4 hours has been set for feeds, giving sets and feeding containers (Patchell 1998, Handbook of Paediatric Nutrition, Anderton 1995).

### 5.3 Expressed Breast Milk (EBM)

EBM must be used within 4 hours of removal from the fridge. Always check the name on the EBM bottle and dates on label before using. **The feeding giving set and feeding reservoir** must be changed every 4 hours when infusing EBM.

**Rationale to prevent contamination of feeds with bacteria.**
- To prevent colonisation of EBM with bacteria that could cause gastro-intestinal illness of the child (Balmer et al, 2001).
- Expressed Breast Milk left at room temperature can be forgotten and the temperature rises above 4°C increasing the risk of bacterial growth (Guidelines for Nursing Staff on Breastfeeding in OLCHC, 2006; UK Association of Milk Banking 2001).
- Therefore a maximum hang time of 4 hours has been set for EBM feeds, giving sets and feeding containers (American Dietetic Association, BDA Paediatric Group, ASPEN 2009).

### 5.4 Gravity infused Feeds (via syringe/reservoir)

PIF, EBM or Ready to Feed Liquid Formulae are often infused as gravity infused boluses via syringe. **The syringe/reservoir** must be changed after each feed (Anderton 1999).

**Rationale to prevent contamination of feeds with bacteria.**
- Reservoir feeds via syringe are often used for premature and low birth weight infants. This group has been classified as the most vulnerable group
- Feed residues may remain on the syringe and provide a medium for bacterial growth.
- These syringes are for single use only and therefore should not be re-used (Anderton, 1999).

### 5.5 Jejunal feeds.

PIF, EBM or Ready to Feed Liquid Formulae are occasionally fed via the jejunal route. Jejunal feeds, giving sets and reservoirs must be changed every 4 hours (Courtney-Moore M, 1985) when using an Open Enteral System.

**Rationale to prevent contamination of feeds with bacteria.**
- When a patient is fed directly into the small intestine they are at greater risk of developing infection as the defence mechanism of the acidic stomach has been by passed (Courtney-Moore, 1985).
- Therefore a maximum hang time of 4 hours has been set for jejunal feeds, giving sets and feeding containers if using an open feeding system.
- Feeds can hang for extended periods when a Closed Enteral System i.e. when using Sterile Pre Filled Pack feeds (see below).
### ACTION

#### 5.6

**Closed System: Sterile Pre Filled Pack Feeds**

Pre Filled Pack Feeds may be hung for a maximum period of 24 hours if a child is being fed continuously.

**For Bolus Feeds using the pack system.**

- Always use the Infinity Pack giving set with the drip chamber (i.e. not the mobile giving set). This is the giving set used in OLCHC.
- Always leave the giving set connected to the pack between bolus feeds.
- Packs can be left hanging between feeds.
- Use a new giving set every time the pack is changed.
- Minimize the number of disconnections (i.e. disconnection of the giving set from the NG/PEG tube).
- When disconnecting the giving set from the feeding tube (i.e. NG/PEG) use non touch aseptic technique. **Replace clear cap on the purple end of the giving set between feeds.** Do not discard purple tip or clear cap when setting up feeds.
- To be conservative, before reconnecting the giving set to the NG/PEG tube for the next bolus feed, press the “fill set” button on the Infinity pump to flush out the 10-15mls of feed in the tube and refill with new feed from the pack.

### RATIONALE & REFERENCE

**Rationale to prevent contamination of feeds with bacteria.**

- Sterile Pre Filled Pack (Ready to feed) Feeds such as Infatrini™, Nutrini™ and Nutrison™ have been subjected to a heat process by the manufacturer sufficient to kill bacteria that could cause gastrointestinal illnesses (FSAI, 2007).
- Closed Feeding Systems have lower levels of contamination than open delivery systems. Sterile feed containers remain free of bacterial contamination in closed systems for at least 24 hours. (Beattie 1996, Patchell et al 1998).

- The feed or feeding set could become contaminated with bacteria when the feeding system is interrupted (Anderton, 1995).
- The drip chamber prevents retrograde contamination of the feed from the feeding tube (ASPEN 2009 Payne-James JJ).

- There is no need to keep the pack and giving set refrigerated between feeds as there is no evidence to support this.

- This will flush out possible contaminants in the distal end of the giving set (Moffitt et al. 1997).
6.0 POINTS TO NOTE

Additional Points to Note:

- Hands must be thoroughly decontaminated prior to administering feeds.
- Alcohol wipes should be used to clean the top of bottles/cans before decanting (ICNA 2003).
- Avoid unnecessary handling of parts or connections as this increases the risk of introducing bacteria into the system (ICNA 2003).
- Ideally feeds should not be interrupted however if this is necessary use a non touch aseptic technique when disconnecting and reconnecting (ICNA 2003).
7.0 SUMMARY: GUIDELINES ON THE HANG TIME OF ENTERAL FEEDS & PLASTICS FOR INPATIENTS

Feeds and plastics should always be handled using a non touch aseptic technique. Always check the label and date on bottle or pack before using.

<table>
<thead>
<tr>
<th>System</th>
<th>Max Hang Time of Giving Set Pack/ Reservoir</th>
<th>Max Hang Time of Feed</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sterile Pre Filled Pack Feeds or Closed Systems (e.g. Infatrini™, Nutrini™ and Nutrison™ range of feeds)</td>
<td>24 hours</td>
<td>24 hours</td>
<td><strong>Pack feeds and Closed Systems</strong>&lt;br&gt;<strong>Sterile Pre Filled Pack feeds</strong> may be hung for a maximum period of 24 hours if child is being fed continuously (ASPEN 2009). <strong>For Bolus Feeds using the pack system.</strong>&lt;br&gt;• Always use the Infinity Pack giving set with the drip chamber (i.e. not the mobile giving set). The drip chamber prevents retrograde contamination of the feed from the feeding tube (ASPEN 2009). This is the giving set used in OLCHC.&lt;br&gt;• Always leave the giving set connected to the pack between bolus feeds.&lt;br&gt;• Packs can be left hanging between feeds (i.e. there is no need to keep the pack and giving set refrigerated between feeds as there is no evidence to support this).&lt;br&gt;• Use a new giving set every time the pack is changed.&lt;br&gt;• Try to minimize the number of disconnections&lt;br&gt;• When disconnecting the giving set from the feeding tube (i.e. NG/PEG) use non touch aseptic technique.&lt;br&gt;• Replace clear cap on the purple end of the giving set between feeds. Do not discard purple tip or clear cap when setting up feeds&lt;br&gt;• To be conservative, before reconnecting the giving set to the NG/PEG tube for the next bolus feed, press the “fill set” button on the Infinity pump to flush out the 10-15mls of feed in the tube and refill with new feed from the pack.</td>
</tr>
<tr>
<td>Powdered infant Formulae and other Reconstituted Powdered Feeds</td>
<td>4 hours</td>
<td>4 hours</td>
<td>These feeds are <strong>non-sterile</strong>.</td>
</tr>
<tr>
<td>Ready to feed infant Formula (e.g. SMA HE / Infatrini )</td>
<td>4 hours</td>
<td>4 hours</td>
<td>When these feeds are decanted their sterility is decreased and therefore they become non-sterile.</td>
</tr>
<tr>
<td>Expressed Breast Milk</td>
<td>4 hours</td>
<td>4 hours</td>
<td>Always check the name on the EBM bottle and dates on label before using.</td>
</tr>
<tr>
<td>Bolus Syringe Feeds that remain on Reservoir</td>
<td>Change with each feed.</td>
<td>Gravity Infusion</td>
<td>Change with every feed irrespective of feed type.</td>
</tr>
<tr>
<td>Feeds infused via jejunal route (naso jejunal, jejunostomy or gastrojejunal).</td>
<td>4 hours&lt;br&gt;24 hours for Closed Enteral Systems</td>
<td>4 hours&lt;br&gt;24 hours for Closed Enteral Systems</td>
<td>When a patient is fed directly into the small intestine there is a greater risk of developing infection as the defence mechanism of the acidic stomach has been bypassed (Courtney-Moore, 1985). Therefore decanted feeds and plastics should only hang for 4 hours. <strong>Sterile Pre Filled Pack feeds</strong> may be hung for a maximum period of 24 hours if child is being fed continuously (no disconnection of system) via jejunal route.</td>
</tr>
</tbody>
</table>

References

- Anderton A. Micobial Contamination Of Tube feeds. How can we reduce the risk? Pennines 2000;16 3-8
8.0 REFERENCES

- Balmer, S. E. et al (2001) *Guidelines for the collection and handling of mothers' breast milk to be fed to her own baby on a neonatal unit*. 2nd Ed. London, United Kingdom Association for Milk Banking.
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