Managing Everyday Challenges in the Tube Fed Patient: A Focus on Hydration

Rose Ann DiMaria-Ghalili, PhD, RN, CSNC
Associate Professor
Disclosures

Nestlé HealthCare Nutrition Speaker

Objectives

- Explain 2 strategies for implementing hydration management in tube fed patients.

- Identify at least 2 approaches for managing GRV in tube fed patients.
Water: A Vital Nutrient

The ethical issues of hydration management at end-of-life is beyond the scope of this presentation.

Hydration

- 2004: Institute of Medicine issued first official recommendation for water intake
- Adequate Intake (AI) for Total Daily Water
  - Adult Women 2.7 liters
  - Adult Men 3.7 liters
- Caveats
  - Healthy people—thirst be their guide
  - AI not suitable for athletes, military personnel in hot environments, people who are ill, elderly or infants—sense of thirst or ability to communicate it not adequate reflection of water needs

Total Body Water Fluid Loss

Traditionally:
1. Dehydration: loss of body water mainly from the intracellular compartments
2. Volume depletion: loss of extracellular fluid clinically affecting the vascular tree and interstitial compartment

Most clinicians use the term “dehydration” for any loss of total body water.

Dehydration Council Definition

(American Medical Directors Association)

Long-term Care

- Dehydration is a complex condition resulting in a reduction of total body water.
  - Water deficit (water loss dehydration)
    - Hypernatremic or hyponatremic (with hyperglycemia)
    - Both a salt and water deficit (salt loss dehydration)
    - Hyponatremic or rarely isotonic
- Dehydration is due to disease and/or effects of medication
- Dehydration is not primarily due to lack of access to water
- Cannot be defined clinically by a single symptom, sign, or laboratory value
Acute vs Chronic Dehydration

- **Acute dehydration**
  - Water and sodium loss—vomiting, diarrhea, sweating, blood loss or fluid accumulation

- **Chronic dehydration**
  - Fluid imbalance over a longer period caused by insufficient fluid intake, more common in older adults, long-term care settings or unsupervised community–dwelling older adults


Prevalence of Dehydration

- **Hospital**
  - 1991: 6.7% of all Medicare admissions had dehydration as one of 5 diagnosis (Warren, 1994)

- **Nursing Home**
  - Dehydration rate 30–33% (Colling et al, 1994; Mentes, 1999 & 2006)

- **Community Need**
  - AHRQ Prevention Quality Indicators
    - Used to assess the number of admissions for dehydration per 100,000 population in Metro Area or county.
    - As a Prevention Quality Indicator (PQI), dehydration is not a measure of hospital quality, but rather one of the measures of outpatient and other health care.


Risk Factors for Dehydration

- Age (very young or old)
- Mobility and functional disability (cognitive impairment)
- Incontinence
- Chronic illness
- Medications
- Institutionalization
- Air-fluidized beds
- Vomiting
- Diarrhea
- Fever and acute infections
- Burns
- Blood volume loss
- Tube feeding
- Nasogastric tube drainage
- Fistula drainage
- High-output ostomies


Recognizing Dehydration

**Signs & Symptoms**

- Sunken eyes
- Dry tongue with longitudinal furrows
- Dry mucous membranes
- Muscle weakness and cramps
- Speech difficulties
- Confusion
- Poor skin turgor
- Orthostatic BP changes
- Tachycardia
- Light-headedness and orthostasis
- Thirst

Biomarkers

- Hematologic indices
  - Serum sodium > 148 mmol/L
  - BUN/Cr ratio > 25
  - Serum osmolality ≥ 295 mOsm/kg
    - “gold standard”
- Urinary indices
  - Color-standardized color chart
  - Specific gravity > 1.028

Consequences of Dehydration

- Increased length of stay
- Death
- Hospital admission
- Functional decline and delirium
- Pressure ulcers
- Increased health care costs
- Chronic dehydration
  - Delirium
  - Urinary and respiratory infection
  - Falls
  - Constipation
  - Medication toxicity


Dehydration and Tube Feeding

- Prevalence of dehydration in tube-fed patients is unknown
  - 18% of tube-fed patients in long-term care had ≥ 4 dehydration markers (Leibovitz)

- Increased risk for dehydration
  - Water administered by prescription
  - Amount administered dependent on prescribers’ and caregivers’ knowledge
  - Careful monitoring


Hydration Management and Tube Feeding: Fluid Needs

The enteral product (formula) administered for tube-feeding is not sufficient to meet the daily fluid requirements in a tube-fed patient.
## Water Content of Select Foods

<table>
<thead>
<tr>
<th>Food</th>
<th>Water Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>91–100%</td>
</tr>
<tr>
<td>Coffee</td>
<td>91–100%</td>
</tr>
<tr>
<td>Watermelon</td>
<td>91–100%</td>
</tr>
<tr>
<td>Fruit juice</td>
<td>80–90%</td>
</tr>
<tr>
<td>Milk</td>
<td>80–90%</td>
</tr>
<tr>
<td>1 kcal/mL tube feeding formula</td>
<td>80–90%</td>
</tr>
<tr>
<td>Frozen yogurt</td>
<td>70–79%</td>
</tr>
<tr>
<td>1.5 kcal/mL tube feeding formula</td>
<td>70–79%</td>
</tr>
<tr>
<td>Liquor</td>
<td>&lt; 69%</td>
</tr>
<tr>
<td>2 kcal/mL tube feeding formula</td>
<td>&lt; 69%</td>
</tr>
</tbody>
</table>

*Campbell, S. M. (2007). Hydration needs throughout the lifespan. JACN 26(suppl 5): 585S–587S.*

## Fluid Requirements in Adults*

<table>
<thead>
<tr>
<th>Formula</th>
<th>70 kg, 165.1 cm, Female, 1800 kcal per day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight-based</td>
<td></td>
</tr>
<tr>
<td>35 mL/kg/day</td>
<td>2.5 L/day</td>
</tr>
<tr>
<td>100 mL/kg for the first 10 kg of weight, then 50 mL/kg for the next 10 kg of weight (11–20 kg), then 20 mL/kg for every kg of weight above 20 kg</td>
<td>2.8 L/day</td>
</tr>
<tr>
<td>Body surface area-based</td>
<td></td>
</tr>
<tr>
<td>1500 mL/m²/day</td>
<td>2.7 L/day</td>
</tr>
<tr>
<td>1 mL for every kcal consumed</td>
<td>1.8 L/day</td>
</tr>
</tbody>
</table>

*Absolute minimal adult fluid needs: Urine output + 500 cc/d*  
*Does not apply to those who are fluid-restricted.*


Water Balance *

- Measurable intake
  - Consumption: 2.4 L/day
  - Total 2.4 L/day
  - Net fluid balance 0.6 L/day
- Measurable Output
  - Feces: 1 large (0.3 L)
  - Urine: 1.5 L/day
  - Total: 1.8 L/day
- Actual Intake
  - Consumption: 2.4 L/day
  - Metabolism: 0.2 L/day
  - Total: 2.6 L/day
  - Net fluid balance: 0 L/day
- Actual Output
  - Sweat: 0.55 L/day
  - Lungs: 0.25 L/day
  - Feces: 0.3 L/day
  - Urine: 1.5 L/day
  - Total: 2.6 L/day

*Hypothetical 70 kg adult


Hydration Management Methods for Tube-feedings: Water Flushes

- Water flushes
  - Maintain patency of feeding tube
  - Provide required water for hydration
- When to flush with water
  - After tube-feeding delivery
  - Periodically during continuous feeding
  - Before and after medication
- Documentation
  - Record water flushes on intake and output record

Question

- Do you use sterile water for tube feeding flushes at your facility?
  - Yes
  - Only in immune-compromised patients
  - No
  - Not sure

Hydration Management Methods: No Tech–Manual Water Flushes

- Syringe Method
  - Supplies: Large (60–mL) syringe
  - Procedure:
    - Draw up water into syringe and instill in tube, or
    - Remove plunger of syringe, attach to tube, hold up to allow free-flow by gravity
    - When available, use the y-port of feeding tube instead of disconnecting tubing during continuous feeding

Hydration Management Methods: Low Tech Water Flush Devices

- Enteral feeding bag
- Procedure:
  - Fill an enteral feeding bag with required amount of water
  - Suspend bag on an IV pole
  - Infuse water into tube by free flow, roller-clamp flow adjustment, or enteral pump
  - Discard bag after 24 hours to prevent bacterial contamination


Question

- Does your facility use flushing pumps?
  - Yes
  - No
  - Not sure
Hydration Management Methods: High Tech Water Flush Devices

- Enteral pump delivery systems with automatic flush bags
  - Separate bag filled with water and hangs along side of feeding bag
  - Pump is programmed to deliver water flushes periodically.
  - Design features vary depending on manufacturer:
    - Small regulated water flushes to prevent clogging
    - Regulate the amount of water administered to meet patient’s fluid requirements
- Note: increased cost due to two delivery bags

Advantages of Automatic Flush Systems

- More effective than manual flushing in those requiring continuous feeding
- Less tube clogging compared to manual flushing
- More cost–effective:
  - Saves nursing time
  - Prevents missed water flush
    - Tube patency
    - Hydration status
- Potential to decrease contamination

Patient or Caregiver Communication

- Know the numbers
  - Amount of formula and rate of tube-feeding
  - Amount of water flushes per day

- Diary of daily intake and output
  - Amount of formula, water, and other fluids administered through the tube each day
  - Number of stools and consistency
  - Other output (e.g., fistula)

- Recognize signs of dehydration
  - Thirst, dry mouth, weakness, fever, small amounts of dark strong-smelling urine

- Notify health care provider
  - Missed feeding for more than a day; tube dislodgement or clogged tube, dehydration, vomiting, diarrhea

How much is that flush?

= 4 tablespoons

60 mL

≠ 1 glass of water (240 mL)
4 x 60 = 240

**Question**

- What do you use to calculate fluid requirements?
  - 1 mL/kcal
  - 35 mL/kg
  - Other

**Case Study**

- Mr. Jones, 68 years old, was admitted to MICU with pneumonia and is on a ventilator. He receives tube feeding through a small bore feeding tube. Ht: 5’10”, weight 75 kg.
- Enteral product:
  - 1 kcal/mL, 100 g CHO, 50 g Pro, 20 g Fat per Liter.
- Goal: 1800 mL/day tube feeding over 18 hours
- Fluid requirement range:
  - 1 mL/kcal: 1800 mL/day to
  - 35 mL/kg: 2625 mL/day
- Water from tube feeding:
  - 840 cc/L x 1.8 L = 1512 cc/day water
- Extra Water needed as flushes:
  - 1800−1512=288 mL/day to
  - 2600−1512=1088 mL/day

Gastric Residual Volumes

- Monitoring GRV widely used method to determine intolerance to enteral feeding
- Influenced by position of patient, type and size of syringe, size and position of tip of feeding tube
- Controversy
  - Large GRV risk for aspiration
  - What is “Large”
  - Large GRV not always sign of intolerance
  - Low GRV not always indicative of aspiration risk
- Holding feedings due to GRV leads to inadequate caloric delivery

Question

- What GRV does your facility identify before placing tube feedings on hold?
  - < 150 mL
  - 200 mL
  - 250 mL
  - 500 mL
  - Other

Current Nursing Practice

- Metheny surveyed 2298 critical care nurses
  - 97.1% reported using GRV to monitor GI intolerance
  - 80% checked GRV every 4 hours
  - Respondents reporting holding feedings for GRV:
    - < 150 ml (24.9% of respondents)
    - 200 ml (36.5% of respondents)
    - 250 ml (24.1% of respondents)
    - 500 ml (12% of respondents)

Published Guidelines

- SCCM/ASPEN Nutrition Support—Critically ill
  - GRV 200 mL–500 mL raise concern and implement measures to reduce risk of aspiration
  - Automatic cessation of feeding should not occur for GRV < 500 mL in absence of other signs of intolerance
- Canadian Clinical Practice Guidelines—mechanically ventilated
  - Prokinetics at initiation and GRV of 250 mL
- ESPEN
  - IV administration of metoclopramide or erythromycin if intolerant to enteral feeds (high GRV)


ASPEN Enteral Nutrition Recommendations

1. Evaluate all enterally fed patients for risk of aspiration (A)
2. Assure that the feeding tube is in the proper position before initiating feedings (A)
3. Keep head of bed elevated at 30° – 45° at all times during administration of enteral feedings (A)
4. When possible use a large–bore sump tube for the first 1–2 days of enteral feeding and evaluate gastric residuals using at least a 60 mL syringe (A)

A: Good research–based evidence to support the guideline
B: Fair research–based evidence to support the guideline
C: Expert opinion and editorial consensus
5. Check GRV every 4 hr during first 48 hrs for gastrically fed patients.
   ◦ After goal rate is achieved and/or sump tube replaced with small-bore feeding tube, GRV reduced to every 6–8 hrs in non critically ill (C)
   ◦ Critically ill patient maintain q 4 hour GRV (B)
6. If GRV > 250 mL after second GRV consider promotility agent in adult patient (A)
7. GRV > 500 mL: hold EN and reassess patient tolerance
   ◦ Physical assessment, GI assessment, glycemic control, minimize sedate, promotility agent (B)

8. Consider feeding tube below ligament of Treitz when GRV are consistently measured > 500 mL (B)
9. Pediatrics
   ◦ If continuous feeding–check q 4 hours and hold if the volume is greater than or equal to the hourly rate
   ◦ If bolus feeding: check GRV before each feeding and hold if residual volume is more than half of the previous feeding volume (C)

Return or discard the GRV

- Return to the stomach

Summary

- Hydration management is a critical component of the plan of care for tube-fed patients.
- Tube-feeding protocols should incorporate current evidence-based practice guidelines and expert recommendations to optimize the delivery of nutrition therapy.
Thank you!

Sponsored by:

Nestlé Nutrition Institute

Sponsor Disclosure: Financial support for this presentation was provided by Nestlé HealthCare Nutrition, Inc. The views expressed herein are those of the presenter and do not necessarily represent Nestlé’s views. The material herein is accurate as of the date it was presented, and is for educational purposes only and is not intended as a substitute for medical advice. Reproduction or distribution of these materials is prohibited.

Copyright 2013 Nestlé. All rights reserved.