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Part IV Enteral Feeding:
Hydrating the Enterally-Fed Patient – It isn't Rocket Science


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Enteral nutrition (EN) provides primary sustenance to thousands of individuals each day in the hospital, long term care, and home settings. In addition to determining appropriate nutrient requirements, assessing hydration needs is every bit as important. Unfortunately, specific guidelines for clinicians to determine fluid needs do not exist and the equations routinely used are without evidence. The purpose of this article is to approach hydration in the stable EN-fed patient from a practical approach, as well as to review the body's physiologic need for water.

The following two scenarios occur all too often:

CASE 1

80 y/o male admitted from clinic with failure to thrive and to rule out a possible GI bleed. His medical history includes stage III, SCC of tongue with dysphagia (PEG-dependent), CVA without deficits, and constipation secondary to opioid use. No renal, hepatic or cardiac history. He was recently discharged (5 days prior) for a similar issue. His wife reported that during that admission he was NPO the first 3 days for workup, and the day of discharge his tube feedings were restarted. Intravenous fluids (IVF) were not given other than during an EGD. A GI bleed was ruled out both admissions.

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Home EN Regimen:

- 1.5 cal/mL product, 1 can x 5 per day via PEG
- H2O: 240mL after each feeding

Height: 5' 10" (178 cm)

Weight history:

Current weight: 138# (62.7kg)

UBW: 164# (74.5 kg)

IBW: 166# (75 kg)

Lab values: See Table 1

Nutrition Assessment:

Patient with weight loss due to both lost enteral feeding time and a component of dehydration. Dehydration suspected due to back to back

Table 1. Laboratory Values

Pertinent Labs	Last Admission	Day of Discharge	Day 1 Readmission HD1	Date of Assessment HD4	Day of Discharge (after hydration) HD6
	U.S./SSI	U.S./SSI	U.S./SSI	U.S./SSI	U.S./SSI
Na	137	134	136	136	136
K	3.8	4.1	4.2	4.2	3.5
CO2	26	26	25	24	26
BUN	10/3.6	24/8.6	27/9.6	48/17	18/6.0
Creatinine	0.6/53	0.7/62	0.7/62	0.7/62	0.6/53

admissions, NPO status for procedures without IV support, elevated BUN/creatinine ratio, and the patient's report that the IV nurse has had a difficult time finding a vein for a blood draw. Both primary team and GI consult service agreed that his initial presumed "GI bleed" was non-contributory (no change in hematocrit), and that he most likely had just gotten behind on fluids. He also needs more calories than his current regimen provides.

Nutrition team made the following recommendations:

1. D5, ½ normal saline @ 75mL/hr x 2 liters, then reassess if he needs an additional liter.
2. Whenever NPO, provide D5, ½ NS @ 75 mL/hr for maintenance.
3. When patient is allowed to resume EN, start:
   - 1.5 cal/mL product, 300mL per feeding at: 0600, 1000, 1400, 1800, 2200.
   - Provide 120mL water before and after each feeding; some of that water may be used for medication flushes as needed.

CASE 2

An 85 year old male was admitted with diarrhea (+ for Clostridium difficile), mental status changes, and acute renal failure. He is status post a recent stroke, PEG tube-dependent, and was discharged to a skilled nursing facility two weeks earlier. No prior history of renal, hepatic or cardiac disease.

EN Regimen at initial discharge 2 weeks earlier:

- 1.5 cal/mL product, 1 can x 6 per day via PEG
- H2O: 240mL after each feeding

See Table 2 for a chronology of his BUN/creatinine ratio.

Nutrition Assessment:
While this patient's EN regimen and water flushes would normally meet all of his nutrition and hydration needs, his dehydration resulted from not only leaving the hospital already behind on hydration, but also from staggering stool/electrolyte losses as the C. diff infection took hold. He required several liters of volume repletion IV fluids before his BUN/creatinine ratio normalized and his weight was back to near baseline of his last discharge.

Nutrition team made the following recommendations:

1. Resume patients EN regimen of:

- 1.5 cal/mL product, 1 can x 6 per day via PEG
- 120mL water before and after each feeding; some of that water may be used for medication flushes as needed.

INTRODUCTION

"There is plenty of water in the universe without life, but there is no life without water." Sylvia A. Earle

Dehydration is a common primary or secondary diagnosis upon hospital admission[1-4] and is associated with untoward clinical consequences (see Table 3). In 2004, Xiao reported that the number of hospitalizations for dehydration in both community dwelling and long term care elderly had increased to over 500,000 cases annually.[5] Patients admitted to acute care facilities with a

Table 2. Laboratory Values

Pertinent Labs	4 Days Prior to Initial d/c	Day of Discharge to SNF	Readmission (11 days after d/c) HD1	HD4	Day of 2nd Discharge HD9
	U.S./SSI	U.S./SSI	U.S./SSI	U.S./SSI	U.S./SSI
Na	136	137	138	139	137
K	4.2	4.3	5.1	4.8	4.3
CO2	24	23	18	21	23
BUN	13/4.6	29/10	176/63	82/29.3	17/6.1
Creatinine	0.7/62	0.8/71	5.1/451	3.8/7249	0.9/80

diagnosis of dehydration experience a much higher morbidity and mortality (hazard ratio = 6.04).[6] In a recent systemic review, dehydration was one of the most common causes of unplanned, but preventable contacts for outpatients with head and neck, gastrointestinal, and esophageal cancers undergoing radiotherapy.[1] In 2013, Drake found that >43,000 Medicare beneficiaries receiving EN were admitted for acute care hospitalization with dehydration and/or malnutrition.[3] Dehydration was substantially more common than malnutrition; >two-thirds of these patients (67%) were admitted with dehydration in the absence of malnutrition. The financial costs of dehydration are significant; the Agency for Healthcare Research and Quality lists dehydration as one of the top 10 most common preventable diagnoses with an estimated annual cost of $1.6 billion due to hospital related charges.[7]

Subclinical or chronic underhydration is a common finding in elderly nursing home residents whether on EN or oral intake alone.[8] Bennett documented chronic dehydration in 48% (89/185) of elderly patients presenting to an emergency department.[2] While many patients have disease states or other factors that cause them to become dehydrated in the long term care setting prior to admission,[9] Snyder and Borra et al reported as many as 40% of patients developed dehydration after hospital admission.[10,11] El-Sharkawy found 37% (69/200) of older patients (≥65 years) admitted to a large teaching hospital were dehydrated on admission; 22 (11%) were still dehydrated at 48 hours.[6] Cases of patients being discharged inadequately hydrated have also been reported; the incidence of iatrogenic dehydration after admission to the hospital was 3.5% in one study[12] and 2.1% in a later study.[7] Crary showed that use of modified dysphagia diets as well as tube feeding was significantly associated with poor hydration status at discharge (66% and 50% respectively).[13] Leibovitz found that 75% of patients orally fed with feeding difficulties and 18% of EN-fed patients had markers of dehydration and went on to remark, "Dehydration in the EN-fed patient is surprising since the accepted view is that these patients should be sufficiently hydrated".[9] Clearly, having enteral access does not ensure adequate nutrition or hydration. Finally, Vivanti compared fluid delivery from food, enteral, and parenteral routes in hospitalized patients with dysphagia against calculated requirements and demonstrated that while enteral and parenteral fluids were a significant source of fluid, calculated fluid requirements were still not achieved in the majority of patients.[14] This further sets our patients up for readmission or increased morbidity and mortality. We can, and must, do better.

The purpose of this article is to arm the clinician with a practical, common sense approach to assessing hydration in the vulnerable EN-fed population and to provide suggestions to improve identification and intervention in order to prevent its occurrence in the first place.

A Word About Dehydration and Lab Values

The intent of this article is not to detail the different types of dehydration, differentiate between volume depletion vs. dehydration, or provide a complete guide to assessing laboratory values (although a nice review is available elsewhere).[15] However, there are some basic concepts that are helpful to keep in mind.

Table 3. Clinical Sequelae Associated with Dehydration[17,21,33,34]

- Urinary tract infections
- Urolithiasis
- Acute kidney injury
- Pressure ulcers
- Confusion/ disorientation/ delirium
- Electrolyte imbalance/ hyperglycemia
- Respiratory infections
- Increase in falls
- Constipation
- Hypotension
- Increased mortality
- Increased health care costs

Table 4. Factors Altering Serum Blood Urea Nitrogen (BUN)

- Dehydration, resulting from inadequate fluid intake or excess fluid losses
- Urinary tract obstruction
- Congestive heart failure or recent heart attack
- Gastrointestinal bleeding
- Hypovolemic shock
- Nephrotoxic agents
  - Chemotherapy
  - Some antibiotics
  - Corticosteroids
- Increased catabolism
  - Trauma, major surgery, severe burns or infection

There is no absolute or universal definition for dehydration, and dehydration may manifest in various ways.[16-19] This contributes to the difficulty clinicians encounter when trying to assess hydration status in the acute care setting. Interviews with physicians revealed no standard process for assessing dehydration.[18] In the most basic terms, hypovolemia (salt and water loss) and dehydration (water loss), are often used interchangeably,[20] and patients frequently have a combination of volume depletion and dehydration.[15] Clinical signs and symptoms have poor sensitivity and specificity[17] and have limited value in making a diagnosis of dehydration; therefore, they should not be relied on to treat or diagnose dehydration. Rather, the diagnosis should be made based on a combination of laboratory values, clinical assessment, and the knowledge of the patient's history; in particular, paying attention to extra losses such as vomiting/ diarrhea, as well as times when a patient has limited access to water (this would include water from EN, oral intake, and IV fluids).

Laboratory values can provide helpful insight to hydration status. In the straightforward patient (no renal, hepatic or cardiac disease), a rising blood urea nitrogen (BUN)/creatinine ratio (albeit a soft target), is an early sign that the patient is getting behind on hydration. Following the trend of BUN levels over time can be useful. This trend is often underappreciated despite frequent routine labs evaluations particularly during inpatient stays. The kidneys filter urea and excrete nitrogen through the urine. Increased BUN levels can be caused by increased urea production, decreased urea elimination, or a combination of the two. This rise is often transient and may be caused by low blood flow due to dehydration, although there are a myriad of other causes (see Table 4).

Increased serum creatinine is usually a function of renal failure or intrinsic renal disease; only in severe dehydration will creatinine rise as a result of acute kidney injury. In the setting of normal renal function, a rising BUN with stable creatinine (a widening BUN/creatinine ratio), can be an early indicator of worsening hydration status. An elevated BUN/creatinine ratio will be present in most cases of encroaching dehydration,[17] as will a drop in weight over a short time period (if accurate weights can be obtained). The kidneys play a very important role in regulating fluid balance and function most efficiently in the presence of an abundant supply of water.[21] It makes sense to supply adequate water to protect these vital organs.

Why Do Our Patients Get Dehydrated In the Hospital?

There are numerous factors in the acute care setting that set our patients up to become dehydrated, remain dehydrated, or even though once rehydrated early on in the hospitalization, over time become dehydrated again. Table 5 lists many of the most common causes of dehydration in the hospital setting. In addition to the more obvious reasons, such as vomiting, diarrhea, or increased ostomy output, there are more subtle situations that may go unnoticed; for example, the patient on a dysphagia diet with thickened liquids, or the patient who is repeatedly NPO (but not consistently enough for clinicians to notice). At times, a patient might not have been fully rehydrated after an episode of dehydration; as a result, they never catch up to baseline. In these cases, even if the EN prescription should meet maintenance hydration requirements, the patient may remain dehydrated, or even become more dehydrated over time. It is critical to understand that patients, particularly EN-fed patients in acute and subacute settings, have limited control over their access to water.

Some patients have extra fluid losses (and therefore increased water and sometimes sodium needs) that may go unnoticed without careful evaluation. A number of 'note to self' moments can occur when doing a visual assessment of a patient; these should trigger a closer assessment of hydration status. These observations may include:

- Excessive perspiration (diaphoresis), noted by a glistening, shiny, or wet appearance to their skin.
- Patients with amyotrophic lateral sclerosis, or other such neurological conditions may experience excessive saliva production (sialorrhea), or just an inability to control their oral secretions evidenced by frequent dabbing of their mouth with tissue or the fact they carry a towel with them.
- Head and neck cancer patients who carry a cup to spit in because they cannot swallow their saliva
- 24/7 rotating fan to keep the patient cool

In any of the above situations, additional fluid will be needed. Many of these fluid losses are difficult to quantify and are not always noted in the medical record. These fluid losses can can add up over the course of a day. The bottom line is, if the healthcare team does not consider all of these fluid losses, the patient's volume and hydration status will suffer. Intake and Output (I and O) records are very important in these patients and some clinicians assume that if I's = O's then hydration and volume status are steady; however, it is important to account for insensible losses over and above the standard "outs" and to keep in mind that I and O records might be incomplete.

Iatrogenic causes of dehydration may be the consequences of treatments or just the result of being a patient in the hospital. Medications, such as Lactulose for hepatic encephalopathy, may cause excessive stool loss. Hospitalized patients often remain NPO for procedures for an extended period of time without the addition of maintenance IVF. An all too common scenario goes something like this:

1. NPO at midnight
2. Procedure is bumped from late morning, to afternoon, then to the next day
3. It is too late for meals to arrive and/or EN to be restarted
4. NPO at midnight again

If maintenance IVF is not started in the interim, dehydration will follow.

In patients whose sole source of nutrition and hydration is EN, it is up to the health care team to ensure adequacy of both. Since it is well documented that hospitalized patients do not receive full EN support for a myriad of reasons,[22-24] to assume that water flushes are always given would be folly. Despite this, in a survey of 173 treating physicians, 60% expected improved hydration as one of the benefits of initiating EN.[25]

Evidence for Determining Hydration Requirements in Enterally-Fed Patients

Healthcare professionals are taught various equations to determine hydration (water) requirements (Table 6). Unfortunately, these equations have never been validated, and as such are without evidence to support their use.[26] These calculations can result in dramatically different fluid recommendations depending on the one used (Table 7). They also do not take into consideration clinical assessment, sources of additional loss, or other common sense factors. In addition, these equations presume that the individual/patient is

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Table 5. Causes of Dehydration in the Hospitalized Patient

- Prolonged NPO status
- Temporary NPO status for procedures, tests, lost access, etc.(which occurs multiple times over a hospitalization)
- Restrictive diet orders:
  - Fluid restricted
  - Thickened liquids
  - Pureed
  - Hospital food in general (is a diet restriction in and of itself)
  - Finally, "the length of the diet order is indirectly proportional to oral intake" (CR Parrish quote)
- Sterile water shortage
- Restrictions on IV fluid use
- Practice change to keep patients drier in the critical care setting and this new practice culture extends beyond the ICU
- Patient is rehydrated on admission, then IVF stopped, and over time, they get dehydrated again from NPO status for procedures, poor PO, etc.
- Concern for volume overload
- Inadequate baseline rehydration
- Medications
  - Diuretics
  - Lactulose
  - Colon preps
- Hyperglycemia
  - Worsening hyperglycemia accelerates dehydration, and dehydration worsens hyperglycemia
- Inadequate water flushes ordered with enteral feeding regimen
- Ordered water flushes not received
  - Especially in patients on cycled enteral feeding with an automatic feed/flush bag; when pump is off, water flushes are not infused.
- Increased fluid needs:
  - Diarrhea
  - Ostomy or fistula output
  - Venting gastric tube
  - Vomiting
  - Wounds/wound drainage
  - Percutaneous drains (biliary, pancreatic, etc.)
  - Fever (38-39° C – increased insensible losses)
  - Burns
  - Bleeding
  - Open tracheostomy
  - Chest tubes
  - Air-fluidized beds
- Often Unrecognized increased fluid needs:
  - Diaphoresis (excessive perspiration)
  - Hot/dry environment
  - Patients requiring 24/7 fan in place
  - Inability to swallow saliva normally
    - Patient constantly spitting into cup or carries towel to constantly wipe the saliva from their mouth
    - Patient has spit fistula draining to bag under shirt
  - Excessive saliva output (sialorrhea)— Cerebral palsy, Down's syndrome, neuromuscular disorders such as ALS, head & neck cancers

Table 6. Common Calculations Used To Determine Water Requirements[26]

Formulas	Description
Linear	30mL/kg BW (minimum, 1500mL)
Adjusted	First 10 kg BW = 100mL/kg; next 10 kg BW = 50mL/kg; remaining kg BW = 20mL/kg
Harris Benedict	
Female	1mL/kcal; kcal = 655 + 9.6 wt + 1.85 ht – 4.7 age
Male	1mL/kcal; kcal = 66 + 13.8 wt + 5 ht – 6.8 age
Mifflin St Jeor	
Female	1mL/kcal; kcal = –161 + 9.99 wt + 6.25 ht – 4.92 age
Male	1mL/kcal; kcal = 5 + 9.99 wt + 6.25 ht – 4.92 age
National Research Council	
Female	1mL/kcal; kcal = 354 – 6.91 age + (9.36 wt × PA) + (726 ht × PA)
Male	1mL/kcal; kcal = 662 – 9.53 age + (15.91 wt × PA) + (540 ht × PA)

"euhydrated" or adequately hydrated at the time of the calculation. Unfortunately, patients are often behind in their hydration when EN begins (or become so after EN is initiated) for the many reasons discussed above.

Assessing Hydration Status in Our Hospitalized, Enterally-Fed Patients (aka, "The Down and Dirty" Approach)

If the water equations we have been using for years are unsupported by evidence (and may actually be harmful if clinicians solely rely on the numbers and not clinical assessment resulting in over- or underhydration), what should clinicians do? It begins with good clinical judgment and objective data. There are some basic assessment techniques and key tools for the clinician to keep in mind in the acute care setting (see Table 8).

First, it is helpful to think about basic maintenance fluid requirements and what these are supporting. Basic water intake requirements are generally 1800-3000mL/day (IVF rate of 75-125mL/hour). This is why standard IVF are set to run at 75-125mL/hour. This amount of fluid supports daily ongoing, routine losses (27):

- Urine: 1200-2000mL
- Feces: 100mL
- Skin, Lungs: 500-800mL

Of course additional fluid replacement above and beyond maintenance requirements is necessary to replace any additional losses. An accurate account of ins and outs (I and O) is vital. This can be encouraged and enforced through physician orders, strict I and O orders, and ongoing education and collaboration with the nursing staff. Common sources of fluid loss in the hospitalized patient include: vomiting, diarrhea, ostomy/fistula output, drains, gastric suction/venting, draining wounds, and bleeding. Patients with burns, fever, open tracheostomies, or diaphoresis will have increased baseline hydration needs (see Table 5). Finally, there are numerous interruptions throughout a hospitalization where our patients can get behind on fluids (Table 8). It is up to the healthcare team to monitor these.

All sources of fluid provision and intake should be documented in I and O records in every EN-dependent patient. This includes any oral intake, enteral fluids, IVF, and fluids given with medications. The amount of enteral fluid actually received may differ significantly from what is ordered. Frequent procedures or NPO status is important to note, as well as restrictive diet orders which may include thickened liquids or fluid restrictions. In the stable, non-critically-ill patient, twenty-four hour urine output should be quantified with a goal of >1200mL per day. Urine

Table 7. Calculation Differences – 5 Sample Patients

Criteria	Examples				
Weight (kg)	42	75	110	85	150
Height (inches)	64	71	69	62	68
Age (years)	39	67	54	74	46
Physical Activity (1.2)	1.2	1.2	1.2	1.2	1.2
Formulas	**Est. mL / 24 hours**				
Linear	1260	2250	3300	2550	4500
Adjusted	1940	2600	3300	2800	4100
Harris Benedict					
Female	1176	1394	1781	1415	2198
Male	1193	1547	2093	1523	2687
Mifflin St Jeor					
Female	1083	1386	1768	1308	2191
Male	1249	1552	1934	1474	2357
National Research Council					
Female	1972	2305	2743	2169	3226
Male	2146	2624	3383	2600	4207

color may also give clues about hydration status. Patients who are unable to drink if thirsty are at higher risk than those who can drink freely. Simply asking the patient if he or she feels thirsty can be an important part of the hydration assessment. Frequent ED visits or admissions for dehydration are signs that the current hydration plan is not working.

After a full assessment of Ins, Outs, current hydration status, and level of risk of dehydration, a plan can be implemented. Table 9 includes practical tips to meet hydration goals once fluid needs have been determined. Always ensure that the patient is adequately rehydrated before implementing a maintenance plan. The hydration prescription should also include concrete endpoints to monitor such as urine output, lab values, or other clinical tools discussed in this article. Patients and caregivers can be educated regarding the fluid goals and can play an important role in meeting these goals. Finally, evaluation of hydration status is not a one-time event, but must be reevaluated over time and as the clinical status changes.

When To Recognize It Is Not about the Nutrition and Hydration Prescription

Just as important as knowing how to assess and monitor hydration in our patients is accepting when the clinical situation is not about simple nutrition and hydration, but rather a medical matter. Critically ill patients in the ICU may have complicating issues such as severe intravascular volume depletion, third spacing of extracellular fluids, renal failure, and severe electrolyte abnormalities,[28-30] which require comprehensive care directed by intensivists and other medical specialists to determine the best course of action. This is not a situation for a dietitian to use standard calculations and advise the team on how much fluid to provide or use the invalid "water deficit equation".[31] Of course, once the primary team determines the amount of free water needed, the nutrition team may be asked to provide recommendations to best meet those hydration goals and develop a regimen that provides more or less fluid as indicated. When patients leave the intensive care unit and transition

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to the acute setting, the role of the nutrition team in monitoring hydration and ensuring hydration needs are met becomes important. It takes a village to keep our patients adequately hydrated. IVF are often discontinued, input and output are not measured as meticulously, and things can slip through the cracks. The nutrition team also plays a vital role in developing a successful nutrition and hydration plan for the patient transitioning to home.

Cirrhosis, heart failure, and acute or end-stage renal disease are also circumstances where hydration status is more complex, and standard equations and assessment techniques do not apply. Severe hypernatremia is another situation in which the nutrition team should defer to the medical team for treatment. While there is a desire to treat hypernatremia, "the natural way," i.e., via the GI tract with higher and higher water boluses more often, there are many reasons why this practice should be avoided and IVF should be used.[32]

- For serum sodium < 150mmol/L, it is reasonable to try enteral water replacement up to 1 liter in divided doses (for example, 250mL every 6 hours, or 165mL every 4 hours).
- For serum sodium > 150mmol/L, IV hydration should be given carefully in a controlled and reliable fashion, using dextrose 5% in water or another hypotonic fluid as appropriate for the individual patient.

CONCLUSION

Dehydration is a serious problem in the acute care setting which leads to increased health care costs and increased complications for our patients. Dehydration is both preventable and reversible. Calculations to estimate hydration requirements in EN-fed patients commonly used in practice today are not evidence based, nor do they take into consideration changes in the patient's condition, NPO status, or a myriad of other factors. Clinicians' time would be better spent completing a clinical assessment and focusing on strategies to ensure adequate fluid delivery. A systematic, stepwise approach and better understanding of the signs and symptoms of dehydration will help prevent dehydration in the EN-fed patient population

Table 8. Practical Approach to Assessing and Monitoring Hydration in the Acute Care Patient[35]

It Takes a Village

- First and foremost, accurate I and O records are vital
  - Enforce!
- 24 hour urine output
  - Adequate (< 1200mL/day)?
  - Is urine dark in color?
- Serial weights
- Identify losses
  - See Table 5 for possible sources of fluid losses and considerations
- Identify patients at high risk
  - Frequent admissions
  - Repeated ED visits
  - Multiple procedures
- Are there signs and symptoms of dehydration?
  - Thirst!
  - Dry mouth, sticky/thick saliva
  - Feeling tired all the time
  - Rapid weight change/loss
  - Intake consistently less that output
- Intake
  - What are the current fluid sources?
  - What is the total amount from oral, enteral and IV—what has the patient actually received (not just what is ordered)
  - Can the patient get a drink if they feel thirsty?
  - Has the patient been NPO frequently without IVF?
  - Are they on a dysphagia/thickened liquid diet?
- Primary labs to follow
  - BUN/Creatinine
    - What is the trend over the hospitalization?
    - What has been the lowest they have been (baseline), during this, or last hospitalization if a readmission?
    - Has anything happened to the kidneys?
    - Is just the BUN slowing climbing, but the creatinine remains normal?
    - Is there bleeding or has the patient received diuretics that could cause a rise in BUN
- Is the patient hyperglycemic?
- Does the patient have medical issues that affect the management of fluid status?
  - Renal Issues
  - Cardiac issues/CHF
  - Volume overload
  - Is patient receiving Lasix or other medications that may affect fluid status?

Table 9. Practical Hydration Strategies in Stable Enterally-Fed Patients (Not Critically Ill)

- Ensure patient is adequately hydrated before moving to maintenance plan
- Rule of thumb: all EN-fed patients should start with a minimum of 2 liters water per day including that in their EN formula
    - Adjust up or down as needed based on clinical circumstance
    - May not apply to patients with cardiac, renal or other issues requiring fluid restriction
- Oral Intake:
    - If patient can take fluids orally, can they drink more?
    - Use visuals and provide containers to demonstrate volume needed each day
- If the patient is made NPO, where is their fluid source?
- Enteral:
    - Start with two liters as the goal water prescription and adjust up or down as needed (see above)
    - Increase fluid flush volume or frequency (if the patient needs more than 1500mL of additional water per day, it is time to add IVF)
    - Provide specific details of fluid flushes to nursing—note: water ordered as flushes may or may not be used as medication flushes. In the patient where this may matter, clear instructions will need to be given:
        - Example 1: 250mL water q 6 hours; medication flushes AND 30-50mL water before and after each medication
        - Example 2: 250mL water q 6 hours; ENSURE that some of this water is also used for medication delivery for a total of 1000mL water daily
    - IVF are often turned off when enteral nutrition starts
    - Ensure the patient is receiving prescribed water flushes & EN
        - Are full ordered fluid flushes being delivered (I & O sheets)—are you sure?
    - If the patient is on cycled tube feeding and pump is programmed to give automatic flushes, the patient will not receive automatic flushes when pump turned off
        - If patient on cycled TF, hang 500-1000mL of water and run in over 3-6 hours during time off TF
- Stable non-communicative patient with normal kidney and cardiac function:
    - Increase water flushes if there are clinical signs more fluid is needed
    - Trial of 1-2 liter IV fluid challenge of hydrating fluid as appropriate (½ NS, ¼ NS, D5)
    - Use standing orders such as: if BUN exceeds 20, give 1 liter of ½ normal saline, etc. over 4-5 hours (add D5 if they could use a few extra calories)
- Planning for discharge home:
    - Stop IVF as soon as feasible–ideally 48 hours prior to discharge to “mimic home plan”
    - Advise patients that if they are thirsty, urine is dark, or urine volume is < normal, they may need more water
    - If venting gastric secretions, have external drains, fistulas or high ostomy output will need to replace losses
        - ½ normal saline = ¾ teaspoon salt per liter of water
        - See Electrolyte Content of IV Solutions/liter[27]
    - If need be, give patients urinals to measure their urine output after discharge to ensure adequate hydration—advise them they should make ≥ 1200mL of urine per day
    - If using an open system, can dilute tube feeding and & infuse water with enteral nutrition
    - Have patients measure out set volume of water every morning and use water from container over the day for med & water flushes; ALL needs to be used before bed

throughout hospitalization and at the time of discharge. In other words, clinicians must pay attention to this most basic requirement of our patients: water. ■

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