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## High Output Ileostomies: The Stakes are Higher than the Output



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Recent years have seen a dramatic increase in readmission rates among patients with ileostomies who present with dehydration and/or kidney injury. High readmission rates are often the result of a failure to anticipate what will happen after discharge. Preventing readmission and preserving kidney function in these patients starts with reliable and accurate data collection – including not just stool output, but urine as well – and continues with detailed follow-ups to optimize medications, fluid, and food intake. Supporting patients through the entire process also requires educating them and equipping them with tools to gather and track their output. As clinicians, it is incumbent upon us to develop and execute a practical plan for adequate hydration and output management to not only prevent kidney injury, but also improve the quality of life for these patients.

### CASE STUDY

**A** 46-year-old male with history of ulcerative colitis (diagnosed at age 26), status post total proctocolectomy with J-pouch (1998), proximal diversion with loop ileostomy with 270cm small bowel remaining (2005), presented in 2018 following 5 days of emesis and high output from his ileostomy, ultimately found to be secondary to a narrowing in his ileum causing outflow diarrhea.

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His medications at the time of consult included a PPI BID, 5 mg Lomotil QID, 8 mg Imodium QID, Metamucil TID, cholestyramine BID, oxycodone PRN, and 50 mcg sandostatin q8h.

He is 6' 2" and has maintained a weight of 250-255 lb for years. His BUN and creatinine were 28 and 1.3 respectively, with a reported 24 hour urine output of 1 liter during the winter months, but stated he sometimes goes a day or so without urinating in the summer. He also reports over 300 kidney stones – the first one occurring within 3 months of his loop ileostomy - with over 20 lithotripsies, all of which were managed at an outside facility hence, the surgeon who performed the loop ileostomy was unaware of any of this. After years of failing to meet his hydration needs and repeated bouts of nephrolithiasis, he finally

**Table 1. Readmission and Dehydration and/or AKI in Patients with Ileostomies**

Year	Citation	N	Dehydration &/or AKI*
2001	Beck-Kaltenbach <sup>15</sup>	107	19%
2002	Hallböök <sup>16</sup>	222	32%
2012	Gessler <sup>17</sup>	250	18%
	Hayden <sup>18</sup>	154	20%
	Messariss <sup>19</sup>	603	7%
	Nagle <sup>20</sup>	161	16%
2013	Paquette <sup>21</sup>	201	17%
2014	Gessler <sup>3</sup>	308	19%
	Glasgow <sup>23</sup>	53	39/33%
	Phatak <sup>24</sup>	294	11%
	Tyler <sup>25</sup>	6007	9%
2015	Villafranca <sup>26</sup>	43	30%
2016	Li <sup>4</sup>	84	17%
	Orcutt <sup>28</sup>	104	14%
2017	Iqbal <sup>29</sup>	23	65%
	Fish <sup>30</sup>	113	41%
2018	Justiniano <sup>31</sup>	262	37%

\*Does not include ER visits/admissions at outside facilities

lost his left kidney. During this admission, it was determined that he needed 3 L of IV fluids nightly to prevent dehydration and to protect his remaining kidney.

**INTRODUCTION**

Cases like the one above are not uncommon among patients with ileostomies. As Table 1 shows, recent years have seen a growing focus on readmission rates for dehydration and/or acute kidney injury (AKI) among this population (possibly as a result of stipulations in the Affordable Care Act aimed to decrease hospital readmissions in general).<sup>1</sup> New ileostomy patients are often sent home well hydrated from IV fluids while admitted and with minimal output owing to decreased post-op appetite and intake, but this often does not reflect what will happen after discharge when patients are left to hydrate themselves and their appetite and oral intake picks up. In one study, it was shown that patients readmitted for AKI presented with a

**Table 2. The Clinical Burden of High-Output Ileostomies**

<ul style="list-style-type: none"> <li>• Low urine output</li> <li>• Dehydration</li> <li>• Electrolyte Imbalances</li> <li>• Nephrolithiasis</li> <li>• AKI</li> <li>• CKD</li> <li>• Dialysis</li> </ul>	<ul style="list-style-type: none"> <li>• Fatigue</li> <li>• Frequent leakages</li> <li>• Peristomal skin complications</li> <li>• Social isolation</li> <li>• Reduced physical activity</li> <li>• Depression</li> <li>• Overall well-being</li> </ul>
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3-fold increase in ileostomy output between post-op discharge and readmission (an average of 13 days later).<sup>2</sup> Another study found that patients had significantly decreased GFR at ileostomy closure compared to pre-op ileostomy creation for any cause.<sup>3</sup> Finally, Li et al. showed that 25% of patients with ileostomies develop CKD within 2 years, likely due to recurrent, sub-clinical dehydration.<sup>4</sup>

As clinicians, we are tasked with intervening not only to prevent kidney injury, but also to ease the other clinical and psychological burdens as well as quality of life challenges that so many patients with high-output ileostomies face (Table 2).

**High Output Defined**

As Table 3 shows, there can be many causes of high output, which in turn may lead to dehydration and kidney injury. A normal, mature ileostomy should only make about 1200mL of output each day (Table 4). Jejunostomies can initially put out up to 6 L, but this too will decrease with the help of medication. On the other hand, colostomies usually only put out 200-600mL/day. In the literature, “high output” is loosely defined as  $\geq 1500\text{mL/day}$ .

**Acute Kidney Injury and Dehydration**

As of 2011, expanded guidelines have been proposed based on serum creatinine levels and urine volume, widening the scope of what it means to have an AKI (Table 5). Dehydration, however, is a bit more nebulous. While there is no single way to define it, one of the best indicators is whether a patient is able to make enough urine ( $>1200\text{mL/day}$ ). Other indicators are listed in Table 6. Note that dark urine can sometimes be a side effect of a particular medication, rather than a sign of dehydration. Make sure to ask patients

if they have ever been admitted for dehydration (whether at your own or another outside facility) and/or been to the emergency department and received IV fluids or experienced a kidney stone.

### Treating and Preventing Dehydration: What to Do When an Ileostomy Patient is Readmitted

Treatment for dehydration will look different in ileostomy patients vs. those without ileostomies. In addition to fluid resuscitation with IV fluids, high output ileostomy patients are often told to drink more by mouth. Drinking more, however, does not mean absorbing more fluid and in fact, in some, will drive ileostomy losses further, resulting in even worse dehydration or volume depletion. In patients suffering from ongoing malnutrition, sweetened liquid nutrition supplements (such as Ensure/Boost, etc.) are often recommended, but these too are known to drive stool losses in those with high output. Some patients may notice that if they drink less fluid, their bothersome ileostomy output decreases, but then so does their urine output, often to a volume well below a liter per day. Unfortunately, while many patients are taught to record their stool or ileostomy volume, most are not educated to measure urine also, and this is the most important guide to hydration in these patients. Stool or ileostomy output may look great, but it may come at the expense of an adequate urine output, which may ultimately result in renal demise and chronic kidney insult.

### Data Collection

#### ***Importance of Ins and Outs (I&O)***

For dehydrated, high output ileostomy patients, the first step is to ascertain the patient's true GI anatomy (if not known). If the operative report is unclear, consider ordering an abdominal CT to determine a patient's anatomy and/or the presence of any strictures. If this is not an option, a small bowel follow-through can help determine gross anatomy and transit time through the GI tract.

For an accurate 24-hr I&O while an ileostomy patient is admitted, an order for "Strict or Measured I&O" vs. just "I&O" will ensure greater accuracy—i.e., not just if/when the patient stooled or emptied their ileostomy bag, but the actual volume of each occurrence. In many cases, it is worth having a

**Table 3. Possible Causes of High Ileostomy Output**

- Short bowel syndrome (SBS)
- Poor quality of remaining bowel (acts like SBS)
- Intraabdominal sepsis
- Enteric infection (C. diff, salmonella, etc.)
- Carcinoid
- Proximal stomas / small bowel fistulas
- Recurrent / active disease (e.g. Crohn's flare)
- Medication initiation or steroid withdrawal
- "Outflow" diarrhea from stricture/obstructive process

discussion with the nursing staff to clarify the difference between I&O and Strict I&O. It is also very important that both floor and wound and ostomy nurses document if a patient's ostomy is leaking, or bursting, so all know that the ostomy volume recorded in the medical record is less than what the losses really are. In general, goal urine output should be around 1200mL (or in the case of kidney stone formers, at least 1500mL) each day. Ideally, a goal stool output should be < 1500mL/day, not just to reduce the risk for dehydration, AKI or kidney stones, but also to improve the patient's overall quality of life. Providing patients with the tools to measure both urine and ostomy output is essential (see Figures 1-4).

### ***Sodium***

Patients with high ostomy output are at risk for sodium depletion as jejunal and ileal effluent contain 80-140mEq sodium per liter respectively. It will be important to provide enough sodium in the patients IV fluids to reflect this and adjust as the output is brought down under control. One way to determine if your patient is sodium replete is to obtain a 24 hour or random urine Na level; < 10mmol/L suggests Na depletion.<sup>5,6</sup>

### ***Osmotic vs Secretory Diarrhea***

Some patients who present with high output will require differentiating between osmotic and

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secretory diarrhea. These patients will need to be NPO for 24 hours with IV fluids and possibly parenteral nutrition (PN), if also malnourished. If ileostomy output significantly drops during this time, then it is osmotic in nature and can at least be partially managed by reducing food and/or fluid intake (and replacing with IV fluids as needed). The added benefit of this approach is that your patients will be able to see for themselves how eating and drinking directly drive output. If, on the other hand, ileostomy output remains over 500-800mL/24 hours, then it is considered a secretory diarrhea and will require a different medication and treatment approach.

### Determining a Malabsorptive Component

If you suspect malabsorption, collect a 48-72 hour fecal fat to determine the degree. A patient with severe malabsorption may require PN, whereas a patient with mild to moderate malabsorption may see enough improvement with diet/beverage changes, along with antidiarrheal and antisecretory medications. For younger patients, a 48-hour sample is usually sufficient, but Medicare beneficiaries will need to complete a 72-hour collection. Whichever test you use, ensure that your patients are ingesting/infusing 100 g fat per day either orally or enterally. A patient cannot malabsorb fat if they do not ingest it.

### Food and Fluid Considerations

There is limited data on specialized diets for ileostomy patients other than those with known

short bowel syndrome. Our clinical experience, however, suggests that these patients may benefit from a “relative” short bowel diet, at least until their output is well under control. In general, this diet is high in complex carbohydrates and low in sugar alcohols (contained in many liquid medications<sup>7</sup>), sugar, and sugary beverages (Table 7).<sup>8-11</sup> Those with an end jejunostomy or ileostomy will need additional salt. Once a patient’s output is under control, it is important to begin liberalizing the diet as tolerated to avoid unnecessary restrictions and potential nutrient deficiencies.

Overall fluid intake is patient-specific. In general, hypertonic fluids, which pull water into the small bowel and thereby increase stool volume, should be avoided altogether.<sup>12</sup> This includes fruit juice/drinks, regular sodas, sweet tea, syrup, ice cream, sherbet, sweetened gelatin, and liquid nutrition supplements such as Ensure, Boost or store brand equivalents. Small amounts of hypotonic fluids, such as water, tea, coffee, alcohol, and diet sodas, are allowed. However, bear in mind that hypotonic fluids will pull sodium into the small bowel; sodium in turn will pull water

### Table 4. Normal Ostomy Output Expected → Patients Need to Know This

- Ileostomy: 1200mL (mature ~ 600-800mL)
- Jejunostomy: up to 6 liters
- Colostomy: 200-600mL

Nightingale JM (Ed). Intestinal failure. Greenwich Medical Media Limited. London, England, 2001.

### Table 5. Acute Kidney Injury Defined<sup>32</sup>

Stage	Serum Creatinine	Urinary Output	Examples of Expected Urinary Volume
1	1.5-1.9 x baseline OR ≥ 0.3 mg/dL	<0.5 mL/kg/hr for 6-12 hrs	60 kg female = 180-360 mL 70 kg male = 210-420 mL
2	2.0-2-2.9 x baseline	<0.5 mL/kg/hr for ≥ 12 hrs	60 kg female = 360 mL 70 kg male = 420 mL
3	3.0 x baseline OR Increase to ≥ 4.0 mg/dL OR Initiation of CRRT	< 0.3 mL/kg/hr for ≥ 24 hrs OR Anuria for ≥ 12 hrs	60 kg female = 432 mL 70 kg male = 505 mL

with it, thereby increasing stool volume as well. Initially, a drastic fluid restriction (e.g.  $\leq 120\text{mL}$  with meals plus sips of water with meds for 24 hours) can be a powerful demonstrator to the patient regarding just how much oral fluids can drive output. Remember that all patients will still need to maintain a urine output of at least  $1200\text{mL/day}$ ; hence, some patients will need the addition of IV fluids while undergoing this trial.

Oral rehydration solutions (ORS) will not reduce stool output, but can be helpful in enhancing absorption of fluid in select patients. Consider trialing ORS with a small amount at first (e.g.  $500\text{mL}$  sipped throughout the day). Some patients may prefer ORS in the form of ice cubes or popsicles. Other patients may benefit from a nocturnal infusion via gastric feeding tube as an alternative to IV fluids. A nasogastric trial is recommended first before placing more permanent access to ensure success (and not keeping the patient up all night with yet even more output). In addition to several ready-made commercial products available, patients can make their own ORS at home. See “A Patient’s Guide to Managing Short Bowel Syndrome” (available at no cost) for recipes: [www.shortbowelsyndrome.com/sign-up](http://www.shortbowelsyndrome.com/sign-up)

**Fiber Bulking Agents**

Fiber bulking agents may thicken ostomy effluent from a jejunostomy or ileostomy, but they may hinder absorption of nutrients from food in the small bowel. In stable, well-nourished patients who have a colon, fiber bulking agents can be tried if desired by patient to improve the viscosity of stool, which in turn may improve quality of life (although there is a paucity of data to support benefit in this population). However, in the setting of malnutrition or poor appetite and PO intake, avoid filling your patients up on fiber supplements at the expense of other vital nutrients. In addition, fiber bulking agents may exacerbate electrolyte depletion by binding up minerals preventing absorption. Finally, while fiber bulking agents may thicken stool, they do not hydrate the patient as the water is now bound up in the fiber that is excreted in stool.

**Medication Considerations**

A number of medications can be used to slow down GI transit and reduce ileostomy output. Tables 8

**Table 6. Indicators of Volume Depletion**

- Urine output  $< 1200\text{ mL/day}$ 
  - $< 1500\text{ mL}$  in kidney stone formers
- Dark urine
- Recurrent admissions for dehydration
- Recurrent ER visits
- Recurrent kidney stones
- Decreasing kidney function
- Stool output  $> 1500\text{ mL/day}$
- Rapid weight loss
- Chronic fatigue
- Hypotension
- Dizziness on standing
- Thirst / dry mouth
- Muscle cramps
- Headache

**Table 7. Diet Suggestions for High-Output Ileostomy Patients**

<b>Carbohydrates</b>
<ul style="list-style-type: none"> <li>◆ Generous complex CHO intake (pasta, rice, potatoes, breads, etc.)</li> <li>◆ Avoid simple sugars in BOTH foods/fluids                             <ul style="list-style-type: none"> <li>• Desserts, sweetened gelatin, syrups, candies, pastries, etc.</li> <li>• NO Ensure/Boost or equivalent</li> </ul> </li> <li>◆ Avoid sugar alcohols in liquid medications &amp; sugar free/diabetic foods</li> </ul>
<b>Salt</b>
<ul style="list-style-type: none"> <li>◆ ↑ salt/salty food intake in those with end jejunostomies or ileostomies</li> </ul>
<b>Fluids</b>
<ul style="list-style-type: none"> <li>◆ Drink smaller amounts with meals</li> <li>◆ Sip more between meals</li> <li>◆ Avoid hypertonic beverages</li> <li>◆ Limit hypotonic fluids</li> </ul>

**Table 8. Antidiarrheal Agents<sup>33</sup>**

Agent	Form	Clinical Considerations
Loperamide	Oral: liquid, tablet	<ul style="list-style-type: none"> <li>• Limited CNS effects</li> <li>• Enterohepatic circulation of loperamide can be disrupted with extensive ileal resection</li> </ul>
Diphenoxylate/ atropine	Oral: liquid, tablet	<ul style="list-style-type: none"> <li>• Atropine crosses blood-brain barrier; careful in elderly</li> <li>• Discourages drug abuse by anticholinergic events if &gt; 10 tabs</li> </ul>
Tincture of Opium	Oral: liquid only	<ul style="list-style-type: none"> <li>• Not available in all pharmacies</li> <li>• Costly</li> <li>• Not always covered by insurance</li> <li>• Always dose in mL (NOT drops); caution when eyesight poor</li> <li>• Patients dislike taste immensely</li> </ul>
Codeine	Oral: liquid, tablet (crushed)	<ul style="list-style-type: none"> <li>• Avoid use of codeine/acetaminophen combinations</li> <li>• Risk of acetaminophen toxicity</li> <li>• CYP2D6 genotyping may need to be considered</li> </ul>
Morphine, immediate release	Oral: tablet, liquid	<ul style="list-style-type: none"> <li>• Use with caution in patients with renal impairment</li> </ul>
Cholestyramine	Oral: tablet, powder, suspension	<ul style="list-style-type: none"> <li>• Bile acid binder</li> <li>• Only for use in those with a colon segment</li> </ul>

and 9 list specific antidiarrheal and antisecretory agents that are commonly used to slow output. When maximum doses of loperamide (Imodium) (2-3, QID) and diphenoxylate/ atropine (Lomotil) (2, QID) are taken and ostomy output remains >1500mL/day, it is time to consider stronger gut slowing medications like opioids. In addition to the analgesic effects of opioids they:

1. Delay gastric emptying
2. Disturb the migrating motor complex
3. Slow intestinal transit
4. Increase anal sphincter pressure
5. Inhibit water and electrolyte secretion
6. Increase fluid absorption

thereby, allowing more time for fluid absorption to take place with a reduction in stool output.<sup>13</sup> Likewise, Histamine-2 receptor blockers will not be as effective in reducing gastric secretions as proton pump inhibitors (PPI). In those patients deemed to be net-secretors, if oral PPI is not effective (possibly due to inadequate surface area for absorption), IV PPI, maximum dose, BID

should be tried. Finally, octreotide/sandostatin can be very effective in those who have failed all other interventions. A dose of up to 500mcg q 8 hours may be needed in some.

**Bile Acid Binders**

Bile acid binders (cholestyramine, etc.) are often ordered in an effort to reduce high output. However, they are not appropriate for patients who have an end jejunostomy or ileostomy. The whole purpose of a bile acid binder is to protect the colon from the caustic effects of bile acids that pass through the ileum (normally, 95% of bile acids are reabsorbed in the last 100cm of ileum through the very efficient process of enterohepatic circulation). Unabsorbed bile salts that escape to the colon reduce transit time, decrease fluid resorption, and increase fluid secretion into the colon. As a result of fat malabsorption and calcium binding, they can also potentially lead to increased absorption of unbound oxalate.<sup>14</sup> If one does not have a colon, the only thing bile acid binders will do is

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**Figure 1. Male Urinal**



**Figure 2. Female Urinal**



**Figure 3. Stool Hat.**  
Can be used to measure ostomy effluent



**Figure 4. Ostomy Effluent Measuring Container**



**Figure 5. 30mL Medication Cups**



aggravate fat malabsorption and bind important minerals, nothing more. Bile acid binders are best reserved for patients with terminal ileal resections of <100cm or those with a diseased ileum, and, a colon segment in continuity. In addition to worsening fat malabsorption, fat-soluble vitamin status will need to be monitored more closely; screening for signs and symptoms of essential fatty acid deficiency annually may be wise as well.

### ***The Total Pill Count***

It is essential to review a patient's medication list thoroughly and reduce the oral pill burden wherever possible. This includes prescription and over-the-counter medications, as well as vitamin/mineral supplements. Remember that the more pills a patient has to swallow, the more fluid he/she will be drinking, which can further increase output. For example, Lomotil and Imodium often require large, frequent doses (16-20 tablets/day) and can still leave a patient with a daily stool output of over 1500mL. Codeine, on the other hand, is much more efficient at slowing the gut with fewer pills (often around 4 tablets/day). Tincture of opium is also effective, but is much more expensive, often not covered by insurance, and is not readily available at pharmacies. It also requires good eyesight to measure the dropper dose, and has a particularly unpleasant taste.

**Table 9. Antisecretory Agents<sup>34</sup>**

Agent	Form	Clinical Considerations
Histamine <sub>2</sub> receptor blockers	Oral / IV	Renal function Thrombocytopenia in critically ill patient
Proton pump inhibitors	Oral / IV	Requires adequate small bowel surface area for oral absorption <ul style="list-style-type: none"> <li>○ If efficacy in question, try IV route &amp; stop oral</li> </ul> ↑ pH may promote small intestinal bacterial overgrowth ↑'d risk for C. difficile Hypomagnesemia in some Reevaluate if still needed at 6 months
Octreotide (somatostatin analogue)	SC or IV	Overused in clinical practice Hyperglycemia, cholelithiasis Painful and expensive May inhibit intestinal adaptation

**Table 10. Pharmacological Considerations for High-Output Ileostomy Patients**

- Consider all medications, including prescription, over-the-counter, and any supplements that patient is taking
- Gut-slowing medications are best when scheduled, not PRN
  - No drug will be effective if it is not received by the patient
- Review timing of medications in relation to meals
- Determine the best dose and form for each patient
  - Tablets, capsules, liquid
- Avoid sustained, controlled, extended & delayed-release medications if short bowel, and elixirs/suspensions with sugar alcohols
- Determine whether medications are available at the local pharmacy
  - e.g. most pharmacies do not carry tincture of opium
- Continually reassess for clinical efficacy/need
- Periodically calculate total pill count and reduce/consolidate wherever possible

**The Curse of “PRN” Orders**

In hospitalized patients, “PRN” medications are often not given. Yet, in a patient with high output, to be effective, it is not only imperative to schedule these medications, but to ensure they are taken

**Table 11. Criteria for Using Teduglutide**

- Consider using this drug only if a patient:
- Is on parenteral nutrition or IV fluids > 3 times/week for ≥ 1 year
  - Has been optimized on diet/hydration therapy, anti-secretory meds, and anti-diarrheal meds
  - Is adherent to therapies
  - Has no other contraindications (active GI malignancy, strictures, active IBD, etc.)

before meals/snacks to avoid the “wash out effect.” Some will achieve better efficacy if crushed. Medications such as sustained, controlled, and delayed-released, as well as elixirs/suspensions with sugar alcohols should be avoided. Additional pharmacological considerations are listed in Table 10.

Finally, it is worth mentioning glucagon-like peptide 2 (GLP-2), an intestinotrophic, endogenous peptide released from the distal ileum and proximal colon that enhances gut adaptation in response to enteral nutrients. It inhibits gastric acid secretion and may slow emptying; stimulates intestinal blood flow; increases intestinal barrier function; and enhances nutrient and fluid absorption. In recent years, the GLP-2 analog, Teduglutide (Gattex/Revestive), has demonstrated effectiveness in reducing output and IV fluid / PN requirements in those patients with a high output from short bowel syndrome, provided they meet criteria (Table 11).

#### When an Ileostomy Patient Goes Home: Tools for Success

Before a patient is discharged home or to a facility, if possible, stop all IV fluids and monitor urine output for 2 days to ensure the patient can make adequate urine volume (1200mL). Also make sure patients have been educated on what is “normal”

ileostomy output, what is “high output,” what their goal urine output is before they go home, and who to call if questions or problems arise. In addition, provide patients with the proper tools to successfully measure and track their output and manage all their medications. Stool hats, other ileostomy measuring devices, and urinals (see

**Table 12. Prevent Readmissions & Protect Kidneys**

#### Ideally:

- Demonstrate patient can make 1200mL of urine prior to discharge by stopping all IV fluids for 2 days and monitor

#### Education

- Additional pre-op and post-op education
- Give set daily oral fluid targets—80oz/day (2400mL)—more if needed to keep urine output up.
- Ensure patient is educated about normal ileostomy output, urine output
- Give set urine/ostomy targets
  - Goal is 1200mL of urine daily; 1500mL if they are a kidney stone former
  - Have patients measure both 24 hr urine & ostomy
    - ✓ If they will only measure one of these, make it urine output
- At least biweekly weights initially

#### Measurements

- Routine Periodic labs:
  - Basic metabolic, magnesium at 1 week post-discharge, then as appropriate
- Long term follow up:
  - Basic metabolic (magnesium also, if problematic) at 3 months, 6 months, annually
- In those suspected of Na depletion, check 24 hr urine Na, or random urinary Na

#### Early post-discharge follow up assessment

- By phone, in WOCN or surgery clinic, via electronic medical record, email, etc.:
- Ask patients about:
  - ✓ Any kidney stones?
  - ✓ Emergency room visits at any hospital?
  - ✓ Outside hospital admissions?
  - ✓ IV fluids received anywhere?

#### In those demonstrating high output – Avoid

- Ensure, Boost, etc.
- Sugar alcohols (liquid meds)
- Fruit juices/sugary drinks/lots of fruit
- Sugary desserts, etc.

#### IV Fluids

- Have a low threshold to add IV fluids to any patient demonstrating they cannot maintain a urine output of 1200mL minimum each day eating and drinking normally.

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Figures 1-4), are essential for accurate stool and urine output measurements. A chart for tracking stool/ileostomy output, urine output, and date/time is also essential for monitoring trends and optimizing a patient's regimen. For example, if a patient always records a large stool mid-afternoon, he/she may need to increase gut-slowing medications beforehand. Provide specific volumes for daily fluid/ORS recommendations; if the clinician is not sure a patient understands the volume intended, provide bedside pitchers with graduated markings or other containers to demonstrate the amount needed. Recommend a pill crusher for those medications that can/would benefit from crushing, and send your patients

home with the small 30mL medication cups (see Figure 5) to keep the medication at the ready on their bedside table when gut-slowing medications need to be taken in the middle of the night (thus minimizing competition with food, fluid, and other medications).

Once a patient has left the hospital, closer and earlier follow-up (1-2 weeks post-discharge), along with routine labs and ongoing nutrition counseling will also help prevent readmissions. See summary suggestions in Table 12. For articles and handouts that can help clinicians and patients alike, visit the UVAHS GI Nutrition website [www.ginutrition.virginia.edu](http://www.ginutrition.virginia.edu) and click on "Nutrition Articles" and "Patient Education."

**Table 13. University of Virginia Health System New Nutrition and Hydration Handout for Those with a New Ileostomy**

**When you have an ileostomy it is important to eat enough to stay healthy after surgery. If you have questions about what to eat, you can ask to speak with a dietitian. You can lose fluid and minerals (like salt) with an ileostomy, so it is important to drink enough fluids and not limit salt in your diet, which may be a change for you. Dehydration can lead to serious kidney injury and the need to be readmitted to the hospital. Below are some tips to help you eat healthy after your ileostomy surgery:**

- Always chew your foods well.
- Eat foods you would normally eat. Avoid mushrooms, nuts, corn, coconut, celery and dried fruits the first two weeks after surgery, then slowly re-introduce in moderation.
- Eat 4-6 smaller meals and snacks throughout the day if desired after moderation.
- Eat some protein with each meal or snack. Foods that have protein are eggs, meats (chicken, turkey, fish/shellfish, beef, pork, and lamb), dairy products (milk, cheese, yogurt), nut butters and beans.
- Do not limit salt in your diet – try to eat some salty foods every day such as pretzels, broth, soup, cheeses, etc. Feel free to add a little salt to your foods as well.
- Remember: To protect your kidneys, you will need to drink at least 80 ounces of fluid each day, more if your urine output is not enough (see below). Try to drink half of your fluid as G2 Gatorade and the rest as water, broths, and unsweetened tea.
  - It is important that you make at least 1200mL of urine each day to protect your kidneys. Your surgical team will give you a container to measure your urine and stool. Please measure and record your urine and stool output for 2 weeks after leaving the hospital.
  - If your ileostomy output stays over 1500mL per day, avoid regular sodas, fruit juices, fruit drinks, and liquid nutritional supplements such as Boost, Ensure Plus, etc.
- Contact your surgery team ( \_\_\_\_\_ or \_\_\_\_\_ ) if you notice signs of dehydration (dry mouth, headache, nausea, fatigue, very little and/or dark urine), if you are making less than 1200mL of urine every day, and/or if you lose 5 or more pounds your first week at home.
- An appointment with the ostomy nurse should be made for one week after you leave the hospital to check on your progress. If you have not heard from them, please call the clinic at \_\_\_\_\_.
- \_\_\_\_\_ (Registered Dietitian) is available at \_\_\_\_\_ (8 AM-4:30 PM, M-F) to answer questions you may have about your diet after surgery.

## CONCLUSION

Hydration is essential to preventing kidney injury in patients with ileostomies who already have enough challenges to face as is. Most readmissions for dehydration and acute kidney injury can be avoided with proper planning and anticipatory guidance, along with early and thorough follow-up. Paying closer attention to electrolytes, both stool and urine measurements, along with medication and diet management, can dramatically improve our ileostomy patients' quality of life and reduce readmissions and complications. Also see Table 13 for the new University of Virginia Health System diet/hydration handout developed to help prevent readmission for AKI after new ileostomy creation. ■

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