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REVISITING HIGH OUTPUT ILEOSTOMY PATIENT CARE AND MANAGEMENT

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DISCLOSURE OF FINANCIAL RELATIONSHIPS

- I do not have any relevant relationships to disclose.

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OUTCOMES

- Define high output ileostomy.
- Recognize symptoms of dehydration and kidney failure.
- Identify diagnostics for evaluation of high output ileostomies.
- Understand dietary, pharmaceutical, and surgical management of high output ileostomies.
- Explore new trends for the management of high output ileostomies.

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INTRODUCTION

- Approximately 100,000 ostomies are created in the US annually.
- 40,000 of these are ileostomies.
- Ileostomies are created for multiple reasons including: colorectal cancers, ulcerative colitis, Crohn's disease, diverticulitis, and perforated bowel

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INTRODUCTION

- High output ileostomies continue to be a concern for clinicians and patients.
- 16% – 50% of small bowel stoma patients will experience high output.
- Readmission rates due to dehydration and/ or acute kidney injury can be as high as 65%.

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INTRODUCTION

- Readmission frequently occurs within the first 30 days following discharge.
  - Estimated to cost between 12.9% - 30%,
  - Those requiring readmission vary from 20% - 50%.
- A 30-day readmission rate is estimated to cost between $3000 -$6000/ patient.
- If AKI is present, the cost can be as high as $9107/ patient.

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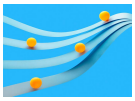
PATHOPHYSIOLOGY

- Ileostomy creation disrupts the normal passage of effluent and electrolytes due to the loss of the colon and ileocecal valve.
- Normally, the small and large intestine absorbs 9-10 L of fluid daily.
  - Jejunum = 6 L
  - Ileum = 2.5 L
  - Colon = 1 -1.5 L
- Postoperatively, ileostomy output resembles normal colonic fluid passage, 1 – 1.5 L per day.



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PATHOPHYSIOLOGY

- Loss of the ileal break mechanism due to resection also contributes to higher output.
- The ileum provide a “braking” mechanism delaying small intestine transit time by a neurohormonal process after eating.
- The ileocecal valve is responsible for slowing the transfer of contents into the colon.
- Loss of these mechanisms can lead to faster small bowel transit times, increasing fluid and electrolyte losses.

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PATHOPHYSIOLOGY

- Intestinal adaptation is the process of the intestinal mucosa post surgery to "adapt" to the new anatomy.
- Adaptation includes, mucosal hypertrophy, hyperplasia, modification of specific gut hormone levels (insulin-like growth factor, growth hormone, epidermal growth factor, glucagon-like peptide- 2), and adjustment of the microbiome to increase absorptive capacity.
- As the mucosa adapts, the ileostomy output decreases.

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PROBLEM

High output, also known as high output syndrome, is a complication associated with ileostomy placement.

There is no standardized definition of what constitutes high output syndrome.

The most common indication is ileostomy output greater than 1500 ml/ day.

Transient high output will occur in approximately half of new ileostomy patients as the initial overflow of bowel contents leave the body.

High Output is Multifactorial!

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PROBLEM

Other Causes of High Output

- Poor quality of remaining bowel (adaptation)
- Intraabdominal sepsis
- Recurrent/ active disease – Crohn's Disease
- Enteric infection – Clostridium difficile
- Occult partial bowel obstruction – outflow diarrhea
- Small intestinal bacterial overgrowth
- Medication initiation
- Steroid withdrawal

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PROBLEM

Clinical Burden of High Output Ileostomy

- Dehydration (most common)
- Electrolyte Imbalance
- Acute Kidney Injury
- Chronic Kidney Disease
- Nephrolithiasis
- Frequent pouch leakage
- Peristomal skin irritation
- Fatigue
- Socal isolation
- Depression

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PROBLEM

- Significant enough that an international clinical expert forum convened in 2024 to revise the definition of high output.
- Attendees practiced in the United States, Canada, France, Netherlands, United Kingdom, Italy, Germany, Australia, South Africa, and Belgium.
- Goal was to include overall health status and contributing factors, along with volume.
- Twelve evidence-based statements were agreed upon centered on defining high output, general management, and the management of peristomal skin.

Carr et al., 2025

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PROBLEM

Definition Statements

- High-output stoma syndrome occurs when the stomal output exceeds the body's ability to maintain normal homeostasis from hydration, metabolic, and nutritional standpoints.
- High-output stoma syndrome has multifactorial causes and consequences.
- High-output stoma syndrome cannot be defined by volume of ostomy output alone.
- High-output stoma syndrome can be defined as acute or chronic.
- High-output stoma syndrome can occur at any time after ostomy formation.

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PROBLEM

General Management Statements

- People with stomas or their caregivers should recognize and respond to the signs and symptoms of high-output stoma syndrome.
- Early detection and intervention are necessary to minimize the complications of high-output stoma syndrome.
- People with high-output stoma syndrome must be managed using a protocol with a multidisciplinary approach.

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PROBLEM

Ostomy Management and Skin Health Statements

- Consider a pouching system with high-output features to manage the ostomy effluent for people with high-output stoma syndrome.
- Skin barriers with high absorbency, adhesion, and cohesive properties are recommended to prevent leakage and maintain skin health for people with high-output stoma syndrome.
- Convex pouching systems are recommended to prevent leakage and maintain peristomal skin health in people with high-output stoma syndrome.
- Skin barriers such as rings/seals/pastes may be required to prevent leakage and maintain peristomal skin health for people with high-output stoma syndrome.

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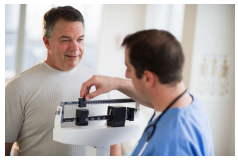
ASSESSMENT



Clinical Evaluation

- Most important – strict input and output recording.
  - Ileostomy consistency and output, <1200 ml/ day
  - Urinary color and output, >1200 ml/ day
  - Fluids consumed throughout the day including how much
- Hypotension
- Tachycardia
- Dizziness
- Dry, sticky mucus membranes
- Fatigue
- Cramping or tingling in hands and/or feet
- Daily weights

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ASSESSMENT

Diagnostic Evaluation

- Labs
  - CBC
    - WBC
  - Electrolytes
    - Sodium
    - Potassium
    - Magnesium
  - Kidney Function
    - Creatinine
    - BUN
- Stool studies
  - Clostridium difficile
  - Fecal fat content
- Imaging
  - CT abdomen/ pelvis with contrast
  - Small bowel follow through
- Ostomy assessment
  - Digitize ostomy to assess for food bolus or narrowing

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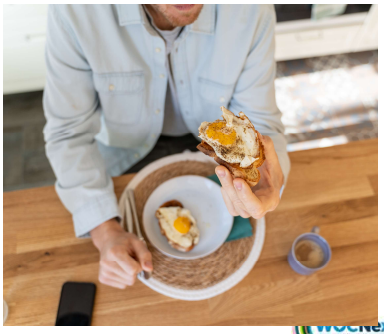
MANAGEMENT

Dietary - General

- American Society of Parenteral and Enteral Nutrition (ASPEN) guidelines for ileostomy patients
  - Low in fiber
  - High in complex carbohydrates and proteins
  - Avoid spicy foods
  - Minimize nuts, seeds, and fruits/ vegetables with skin



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MANAGEMENT

Dietary - General

- Smaller more frequent meals
- Sip do not gulp liquids
- Consume solids and liquids at different times to reduce bolus effect.
- Oral rehydration solutions should be sipped throughout the day.
  - Can also be given in the form of ice cubes or popsicles
- **Minimize** fruits/ vegetables with skin, nuts, seeds to prevent food bolus.
- Recommended caloric intake is 2530 kcal/ Kg/day with 1.52 grams of protein per day.
- Vitamins and micronutrients supplemented as needed.

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MANAGEMENT
Dietary – Hydration

- Recommendation – 1.5 to 2 L of fluid daily
- Limit **hypertonic** fluids
  - Soda
  - Fruit juice
  - Syrup
  - **Nutritional supplementation drinks**.
  - Excessive intake of hypertonic fluids can cause shifts in the osmotic gradient leading to luminal excretion of water and increased ostomy output.

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MANAGEMENT
Dietary – Hydration

- **Hypotonic** fluids
  - Water
  - Coffee
  - tea
  - Alcohol
- > 500 – 1000 ml may lead to shifts in sodium excretion, potentially creating high output.

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MANAGEMENT
Dietary – Hydration

- **Isotonic** fluids
  - Balance saline and glucose
  - Na 90 mmol/ L
  - Same osmolarity as blood plasma
  - World Health Oral Rehydration Solution →

Ingredients
3/8 tsp. salt (sodium chloride)
¼ tsp. table salt substitute (potassium chloride)
½ tsp. baking soda (sodium bicarbonate)
2 tbsp +2 tsp. sugar (sucrose)
Add tap water to make one (1) liter
Optional: Sugar substitutes, based flavoring of choice, to taste

Avery & Snyder, 1990

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MANAGEMENT
Dietary – Fiber

- **Insoluble Fibers**
  - Wheat bran
  - Whole grains
  - Vegetables
- Bulks stool and increases transit time.

- Will promote increased gastrointestinal secretions.
- Not effective in fluid absorption
- May decrease insulin secretion
- May increase energy excretion
- Creates a weight stabilizing effect reducing overall intake and the potential for weight loss.

Insoluble not recommended!

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MANAGEMENT
Dietary – Fiber

- **Soluble Fibers**
  - Oat bran
  - Beans
  - Psyllium
- Binds water and slows transit time.

- Increase viscosity
- Decrease transit time
- Decrease effluent volume

Despite its use in the treatment of high output, evidence on soluble fiber is very limited. More studies are needed on efficacy, especially psyllium fiber. Current recommendations are for 1 tbsp of psyllium fiber mixed in 8 oz of water twice daily. This can be increased to three times daily if needed.

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MANAGEMENT
Dietary – Carbohydrates

- Should be tailored to the patient's specific needs
  - White bread
  - White rice
  - White pasta
  - Pumpernickel bread
- No definitive conclusion on treatment of high output including decreasing ileostomy output or increasing fluid absorption.

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MANAGEMENT

Medications - Antimotility

- Work by affecting opioid receptors
- Delay GI transit time
- Reduce intestinal secretions
- Should be taken at least 30 minutes before a meal

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Management

Medications – Antimotility – FIRST LINE

Loperamide

- Limited oral bioavailability
- Does not cross blood - brain barrier
- Limited CNS effect

Dosing

- 4 mg every 6 hours
- Can consider 6 mg every 6 hours with ECG monitoring.

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Management

Medications – Antimotility – FIRST LINE

Diphenoxylate - atropine

- Atropine added as an abuse deterrent
- Atropine crosses blood – brain barrier, careful in elderly

Dosing

- Starting dose: 2.5 mg every 6 hours
- Maximum dose: 5 mg every 6 hours

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Management

Medications – Antimotility

Codeine

- Metabolized to morphine by CYP2D6
- CYP2D6 mutations can increase or decrease enzymatic activity
  - Increase risk of adverse affects or
  - Decreased efficacy
  - Less commonly used

Dosing

- Starting dose: 15 mg every 6 hours
- Maximum dose: 60 mg every 6 hours

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Management

Medications – Antimotility

Utilize codeine if patient unable to tolerate tincture of opium

Tincture of Opium

- Systemic Opioid
- No dependency
- Not available in all pharmacies
- Costly
- Not always covered by insurance

Dosing

- Starting dose: 0.3 mg every 6 hours
- Maximum dose: 1.5 mg every 6 hours

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Management

Medications – Antisecretory

- Food and liquids are broken down by digestive juices.
- Reduction of secretions from stomach, liver, and pancreas can reduce ileostomy volume.
- Proton pump inhibitors
- Histamine - 2 receptor antagonists
- Somatostatin analog

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Management
Medications – Antisecretory

Proton Pump Inhibitors	Dosing – Lansoprazole	Dosing - Pantoprazole
• Require adequate small bowel surface area for oral absorption. • Increased pH may increase risk for small bacterial overgrowth • Increased risk for C. diff • Hypermagnesemia may develop.	• Starting dose: 30 mg daily • Maximum dose: 30 mg every 12 hours	• Starting dose: 40 mg daily • Maximum dose: 40 mg every 12 hours

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Management
Medications – Antisecretory

Histamine – 2 Receptor Antagonists	Dosing – Famotidine
• Require close monitoring of kidney function • Thrombocytopenia may occur in critically ill patients.	• Based on Creatinine Clearance • CrCl ≥ 50: 20 mg every 12 hours • CrCl < 50: 20 mg daily

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Management
Medications – Antisecretory

- Somatostatin Analog
  - Reduce ileostomy by decreasing salivary, gastric, and pancreaticobiliary secretions
  - Slow small bowel transit
  - Delay gastric emptying
  - May inhibit intestinal adaptation
  - May cause hyperglycemia
  - May cause cholelithiasis
  - Expensive
- Dosing – Octreotide
  - 100 mcg subcutaneously every 8 hours over for 3-5 days.

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Management

Medications – Antimotility & Antisecretory

- Should be started in a stepwise fashion

Medication	Starting Dose	Maximum Dose
Psyllium	1 tbs twice daily	1 tbs three times daily
Loperamide	4 mg every 6 hours	*6 mg every 6 hours
Lansoprazole	30 mg daily	30 mg twice daily
Diphenoxylate-atropine	2.6 mg every 6 hours	5 mg every 6 hours
Famotidine	20 mg every daily	**20 mg twice daily
Codeine	15 mg every 6 hours	60 mg every 6 hours
Octreotide	100 mcg SC every 8 hours	3-5 days

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Management

Medications – Bile Acid Sequestrants

- Cholestyramine
  - Often ordered to reduce high output
  - Protect the colon from caustic bile acids passing through the ileum.
  - 95% of bile acids are reabsorbed in the last 100 cm of the terminal ileum.
  - Unabsorbed bile salts passing through the colon will reduce transit time, decrease fluid reabsorption, and increase fluid secretion.

- **Bile Acid Sequestrants are not appropriate for patients with ileostomies.**

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Management

Medication – Review

It is important to know what medications the patient is taking for other medical co morbidities as these may contribute to high output.

Prescription
Over-the-counter
Supplements

Medications for treatment of high output should be scheduled and not taken as needed (PRN).

Avoid extended-release, delayed-release, enteric coated medications, and suspensions with sugar alcohols.

Continue to reassess medications when treating high output.

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Management
Surgical

- When functional colon remains with a persistently high output ileostomy, stoma reversal is the best long-term solution.
- This is more specific to patients with a temporary ileostomy.
- Patients may need diagnostics to ensure healing of anastomosis prior to surgical intervention.
  - Gastrografin enema
  - Flexible sigmoidoscopy

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Management
Multidisciplinary

- Using standardized protocols has demonstrated better patient outcomes and decreased readmission rates.
- Ongoing monitoring to include early evaluation of the patient's fluid intake/ output to identify any fluid deficits.
- Multidisciplinary team should include
  - Provider
  - Pharmacist
  - Dietician
  - Stoma nurse

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SPECIAL CONSIDERATIONS
Refractory High Output

- Some patients may continue to have high output even after all these steps are put in place.
- Causes include proximal ileostomy, jejunostomy, short bowel syndrome
- These patients may require fasting and total parenteral nutrition (TPN).
- New and innovative pharmaceuticals are helping to liberate patients from TPN.

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SPECIAL CONSIDERATIONS

Refractory High Output

- Glucagon-like peptide-2 (GLP-2)
- Intestinotrophic hormone
- Secreted by enteroendocrine L cells of the intestinal epithelium
  - increases epithelial proliferation,
  - Inhibits apoptosis,
  - enhances barrier function,
  - increases digestion, absorption, and blood flow.
- This helps to improve the absorption of nutrients.
- One study found GLP-2s to reduce the dependence on TPN by 33%.

Nair et al., 2023

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Quick Word on Quality Improvement Project

- From May – July 2023, data was collected on new ileostomy patients to determine need for IV hydration secondary to high output and dehydration.
- Advanced practice provider (APP) standardized follow-up protocol focused on assessing dehydration in a timely manner to decrease postoperative complication and readmissions.
- Seven business day postoperative evaluation with an APP was implemented to include physical examination of the patient, review of the intake/output log, and specific labs indicative of hydration status (creatinine, sodium, potassium, and magnesium).
- Same-day IV hydration was initiated, if necessary, regarding the patients' overall assessment.

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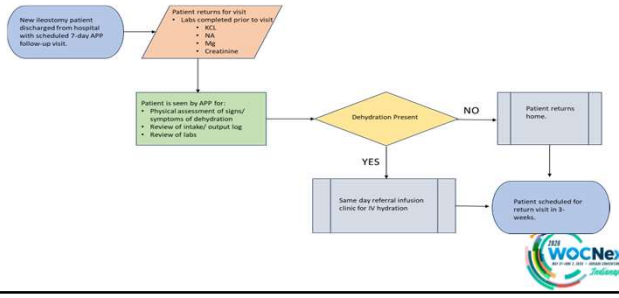
Algorithm for 7-day New Patient Follow-up



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Quick Word on Quality Improvement Project

- APP-led QI project improved dehydration and AKI postoperative complications for the new ileostomy patient.
- A collaborative agreement between CRS and the oncology infusion center helped reduce the number of new ileostomy patients sent to the ED for hydration, possibly decreasing readmissions.
- Results at the time of the project included a readmission rate for dehydration decrease from 10.3% to 2.8%.
- We continue to use this protocol today with low readmission rates related to dehydration.

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CONCLUSION

- High output is an ongoing issue for ileostomy patients.
- It is not only costly, but results in multiple other health concerns.
- Understanding the pathophysiology helps guide management.
- High output is multifactorial.
- Assessment includes clinical evaluation and diagnostic evaluation.
- Management includes dietary, pharmaceutical, surgical and multidisciplinary considerations.
- Don't forget special considerations.
- Ongoing quality improvement projects and evidence-based research is needed.

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CASE STUDY 1

- 79-year-old female with adenocarcinoma of the colon requiring resection and permanent ileostomy 5 years ago. Her medical history is significant for chronic kidney disease, atrial fibrillation, and hypertension. The ileostomy was revised one year ago. Since her revision, she has increased ileostomy output (>1500 ml) requiring an extended hospitalization.
- Her labs are as follows:
  - WBC: 9.7
  - Na: 138
  - KCl: 4.1
  - Creatinine: 2.0
- Medications
  - Apixaban
  - Nifedipine
  - Ondansetron
- What are we worried about?

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Do not edit
How to change the design

What are we worried about?

The Slido app must be installed on every computer you're presenting from slido

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CASE STUDY 1

- Medical History: Chronic Kidney Disease and Hypertension
- Ileostomy output: >1500 ml / day
- Creatinine: 2.0 (0.7 – 1.3)

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CASE STUDY 1

- She was initially treated with loperamide and famotidine. Her output remained greater than 1500 ml per day. She was hospitalized again due to chronic renal failure.
- What are worried about?

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What are we worried about?

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CASE STUDY 1

- Chronic Kidney disease and use of famotidine.
- What would have been a better option?
- Proton pump inhibitor

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What would have been a better option?

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CASE STUDY 1

- Diphenoxylate/atropine and a tincture of opium were added to her regimen with no significant improvement. She was started on weekly octreotide injections. She was hospitalized again and placed on total parenteral nutrition.
- What are our next steps?

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What are our next steps?

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CASE STUDY 1

- Trial of GLP-2
- Continue to monitor labs for hydration status.
- Stop any unnecessary medications.

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CASE STUDY 2

- 68 y.o. male with a past medical history significant for PAD, prior right sided CVA with residual left arm weakness, DM2, HTN.
- He is a lifelong smoker.
- He underwent diagnostic colonoscopy for positive FIT test with multiple polyps throughout the colon.
- He underwent a total abdominal colectomy with end ileostomy due to his risk of developing colorectal cancer in the setting of unresectable multifocal polyposis.
- His hospitalization was uneventful and he was discharged home.

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CASE STUDY 2

- Medications include
  - **celecoxib**
  - **cholecalciferol**
  - **Clopidogrel**
  - **fenofibrate**
  - **gabapentin**
  - **glipizide**
  - **loperamide**
  - **Mag oxide**
  - **metformin**
  - **pantoprazole**
  - **psyllium**
  - **rosuvastatin**
  - **tirzepatide**

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CASE STUDY 2

- He was readmitted 24 hours later for high output ileostomy and acute kidney injury.
- Presented with weakness, hypotension, dizziness.
- Labs
  - WBC: 16
  - Na: 128,
  - KCl: 6
  - Creatinine: 2.6
- What are we worried about?

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What are we worried about?

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CASE STUDY 2

- WBC of 16
- Potassium of 6
- Creatinine of 2.6
- What should we do?

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What should we do?

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CASE STUDY 2

- Admitted for IV resuscitation.
- Imodium was initially scheduled four times daily, decreased to twice daily, then daily as ileostomy output slowed.
- He was discharged home on Imodium daily.

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CASE STUDY 2

- Admitted 2 months later for high output (emptying bag 7-8 times a day), acute kidney injury, hyperkalemia and hypomagnesemia.
- Labs
  - Creatinine: 4.3
  - Na: 126
  - KCl: 7.4
  - WBC: 17.0
  - Mag: 1.5
- What are we worried about?

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What are we worried about?

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CASE STUDY 2

- WBC of 17
- Potassium of 7.4
- Creatinine of 4.3
- What should we do?

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What should we do?

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CASE STUDY 2

- He was provided IV resuscitation.
- Magnesium oxide was decreased from 800 mg twice daily to 400 mg twice daily. Thought to be the cause of his high output.
- Discharged home.

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CASE STUDY 2

- Admitted 1 month later for acute kidney injury and high output.
- Labs:
  - Na: 130
  - KCl: 6.5
  - Creatinine: 1.7
  - Mag: 1.7
  - WBC: 13.7
- What are we worried about and what are we missing?

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What are we worried about and what are we missing?

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CASE STUDY 2

- Potassium of 6.5
- Magnesium of 1.7
- Creatinine of 1.7, although much better
- What should we do?

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What should we do?

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CASE STUDY 2

- STOPPED Metformin 2000mg daily
- HOLD fenofibrate 160mg daily
- START Slow Mag 71.5mg daily in place of Mag Ox
- INCREASE tirzepatide from 2.5mg weekly to 5mg weekly
- DECREASE glipizide from 10mg to 5mg daily
- START loperamide 4mg QID

- Don't forget additional diagnoses!

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QUESTIONS?

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