



- Stoma is the Greek for mouth or opening
- ◆ 2–4 per thousand of the adult populationlive with a stoma
- A high output stoma occurs in situations of Intestinal Failure when there is reduced intestinal absorption so that macronutrient and/or water and electrolytes are needed to maintain health/growth.
- Normally in a healthy adult, about 4 L of intestinal secretions (0.5 L saliva, 2 L gastric acid, and 1.5 L pancreaticobiliary secretions (Nightingale, 2017).



- Does high output stomas (> 1 lit/day) (>1200 ml/day) High output jejunostomy (>3L/24hr)
- $t \ge 1500$ ml for two consecutive days.
- more than 2000ml/day (for more than 3 days)
- more than 2 litres (8 cups) of fluid from your ostomy in a 24 hour period. The output is usually very watery and needs to be emptied 8 to 10 times or more a day.
- A jejunostomy is a high-output fecal stoma and can have up to 6 L/d of stomal output.
- Ileostomy: Initially 1200 mL/d which then decreases to about 600 mL/d.
- Colostomy: 200 to 600 mL/d



- Common causes include extensive bowel resection (secondary to Crohn's disease, Bowel ischaemia) and chronic impairment of bowel function (such as radiation enteritis, dysmotility disorders).
- Potential causes of a high output stoma must be considered and treated as appropriate. Sepsis, sub-acute obstruction, steroid withdrawal (following surgery for inflammatory bowel) and clostridium difficile infection can all cause a high stoma output and should be excluded as the cause

(Baker et al, 2010). Indicati

Indications Of Stoma Formation		
Tuberculous stricture perforation		
Typhoid perforation		
Blunt trauma abdomen		
Fire arm abdomen		
Gangrenous bowel following		
intestinal obstruction		
Anastomosis leak		
Crohn's Disease		
Carcinoma Colon		
latrogenic perforation		



- The management of a high-output stoma is based upon three principles:
- correction of electrolyte disturbance and fluid balance,
- pharmacological reduction of stoma output,
- and treatment of any underlying identifiable cause

Willcutts K, Scarano K, Eddins CW. Ostomies and fistulas: a collaborative approach. Practical Gastronenterology. 2015;November:63–79



Treatment strategies for the management of intestinal failure involve treating sepsis/intraabdominal abscesses, reducing the fistula/stoma output, replacing fluid and electrolyte losses, providing nutritional support, wound care, and psychological support.

Restricting oral fluids:

Glucose-Saline solution:

Antimotility Drugs. Loperamide

Antisecretory Drugs proton-pump inhibitor

Magnesium Supplements

Nutritional Requirements Partial parentral nutrtion

What are the goals of management? The 4 important principles on which management of high-output stoma should

be based are as follows: Correct dehydration and electrolyte

imbalance Reduce stoma output by pharmacologic and

nonpharmacologic methods

If Clostridium toxins are found, treatment with oral metronidazole or vancomycin



• It is a common mistake to encourage patients with a HOS to drink large amounts of hypotonic fluids. Use Oral Rehydration Solution or other "isotonic" solutions for fluid replacement.

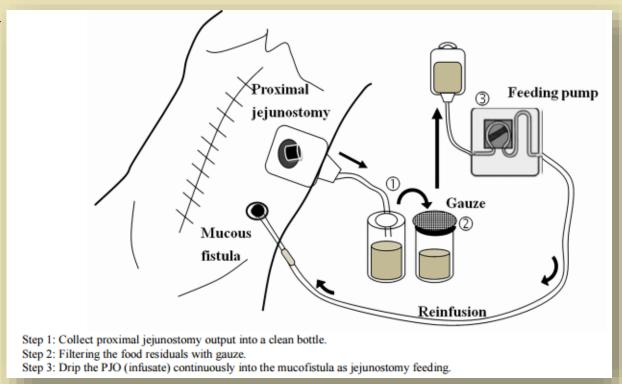
Baker ML, Williams RN, Nightingale JM. Causes and Management of a High Output Stoma. Colorectal Dis. 2014 Nov 3.



proximal stoma by collecting the proximal intestinal effluent and re-infusing it into the distal small bowel. The stoma secretions contain enzymes and electrolytes. Therefore, it is a feasible approach to use reinfusion to maintain electrolyte and fluid status without the inherent risks and expense of intravenous infusion.

The proximal end of the remaining segment of the small bowel was brought out as a mucous fistula through creation of

another stoma





Food – things to try ...

What to try	Reason	
Eat meals regularly. This means eating small meals every 2 to 3 hours or 6 to 8 times a day.	 Prevents you from becoming bloated. 	
	 Helps you to absorb your meals better. 	
	 Helps you meet your nutritional needs and eat enough calories. 	
Chew your food very well.	 Helps you to digest or breakdown your food. 	
Include foods in your diet that may help thicken your stools. See the list of foods in the chart on page 5 that may decrease the number of stools.	 These foods pass through your intestine more slowly or form a gel-like substance. Helps to thicken stool or decrease output. See list on page 5. 	
At each meal and snack try to eat a starchy food and protein food.	 These foods slow the movement of food through your intestines giving your body more time to digest them. 	
Starchy foods include bread, cereal, rice, pasta and potatoes.		
Protein foods include meat, fish, cheese, peanut butter and eggs.		
Add extra salt to your meals or include salty snacks such as crackers, chips or cheezies.	Helps you to absorb fluids better.	
You may benefit from reducing the lactose in your diet.	Helps to decrease bloating and diarrhea.	
Foods with lactose include milk and ice cream.		
Avoid high fibre foods (such as whole grains), stringy foods and foods with skins and membranes and other foods that may increase output.	 Helps to reduce stress on your bowel and symptoms of cramping and bloating. Helps to decrease output. See list on page 5. 	
Avoid foods high in sugar such as white or brown sugar, jam, honey, hard candy, molasses, juice and regular pop.	May worsen diarrhea.	



Foods that may affect your stool output

Foods that may decrease the number of stools and/or diarrhea	Foods that may increase the number of stools and/or diarrhea
Applesauce	Alcoholic beverages
Bananas Bread – white	Beverages that have caffeine such as coffee, tea and cola
Cheese	Chocolate
Oat bran	Dried fruit and pineapple
Oatmeal	Honey
Pasta – white	Jams and Jellies
Peanut butter – smooth Potatoes	Juice especially apple, grape and prune
Pretzels	Licorice
Rice pudding	Nuts
Rice – white	Olives
Tapioca	Peas, beans and legumes
	Pickles
	Popcorn
	Skins and seeds of fruits and vegetables
	Spicy foods/sauces
	Vegetables: broccoli, cauliflower and onions
	Whole grains



Dietary recommendations for patients with ostomy		
Food	Reason	
Eat meals in small amounts frequently, every 2 or 3 h or 6–8 times a day	Prevents bloating Helps digestion and absorption Helps meet nutritional needs	
Include foods in diet that thickens stool	Helps decrease stool output	
Include starchy foods like white rice, white pasta, bread, cereal, and potatoes Include protein foods including fish, meat, eggs, cheese, and peanut butter	These foods slow the movement of food through intestines, giving the body more time for digestion	
Include salty snacks like crackers, chips, pretzels	Helps absorb fluids better	
Reduce lactose in diet	Reduces bloating and diarrhea	
Avoid high-fiber diet like whole grains and food with membranes	Reduces bloating and diarrhea, helps decrease stool output	
Avoid foods high in sugar like jams, jellies, honey, white and brown sugar, molasses	Reduces diarrhea/stool output	

Carlsson, E., Berglund, B., & Nordgren, S. (2015). Living with an ostomy and short bowel syndrome: Practical aspects and impact on daily life. The Journal of Wound, Ostomy and Continence Nursing, 28(2), pp.96-105



Summary Guidance on the Management of a High Output Stoma

STAGE 1: Initial management – Reduce fluid and electrolyte losses

Confirm stoma is a high output; >2000ml/day for >3 days or < 200cm* short bowel remaining or ongoing hydration or electrolyte abnormalities even if volume is 1000 – 2000ml/day

(* in patients with very short bowel <50cm to stoma d/w Nutrition Team prior to commencing loperamide / St Marks. Total oral fluid restriction and reducing gastric secretions are key)

CHECK FOR SEPSIS, STERIOD WITHDRAWAL AND SUB ACUTE OBSTRUCTION AS POTENTIAL CAUSES.

- Restrict ORAL FLUIDS to 500ml daily (Meet fluid /electrolyte needs intravenously)
- Commence loperamide 4mg QDS to reduce stoma losses. This should be given 30-60minutes before meals and at bedtime (if using capsules open and mix with jam/yogurt. Once gut transit time has been reduced whole capsules can be swallowed and the effect on stoma output monitored).
- Monitor strict fluid balance, daily weights, and serum biochemistry, including bone profile and magnesium levels.

Review stoma output after 48-72hours – if settles increase oral fluid intake.

Fordtran JS (2015) Stimulation of active and passive sodium absorption by sugars in the human jejunum. J Clin Invest 55: 728-737





Stage One: Establishing stability.

(When patient unable to tolerate diet and stoma output is above 1.5 litres/24 hours)

- Restrict oral fluids to 500mls per 24 hours.
- Achieve and maintain reliable venous access.
- Administer sodium chloride 0.9% I.V. until the concentration of sodium in the urine is greater than 20mmol/litre.
- Keep Accurate input and output records, closely monitor urine and stoma output.
- Ensure Urine output is above 0.5ml/kg/hr and if systolic blood pressure falls by 40mmhg from baseline or below 90mmhg assess need for bolus.
- Monitor Stoma appliance.
- Send stool culture X3 from 3 different samples
- If inflammatory markers are raised or signs of systemic inflammatory response syndrome (SIRs), consider intra-abdominal sepsis as a cause.

King RF et al. (2014) A double-blind crossover study of the effect of loperamide hydrochloride and codeine phosphate on ileostomy output. Aust NZ J Surg 52: 121-124



STAGE 2: Ongoing HOS – optimise treatment with anti-secretory / diarrhoeal medication

EXCLUDE Clostridium difficile INFECTION – Send stoma output for culture

- Continue oral fluid restriction. (If stoma output is >3000ml/day consider placing the patient NBM for 24 hours to assess gastrointestinal secretions).
- Commence St Marks glucose-electrolyte replacement solution 1000 ml daily, orally, in addition to oral fluid restriction (this replaces stoma sodium losses but will still increase output if taken in excessive amounts). Once IV fluids are stopped, check random urine sodium (aim >20mmol/l).
- Review proton-pump inhibitors. Initiate or change to Esomeprazole/Omeprazole
 40 mg OD-BD to reduce volume of gastric secretions and stoma volume.
- Increase loperamide dose to 8mg QDS
- Add in codeine phosphate 15mg 60mg QDS, 30-60minutes before meals (use cautiously in patients with renal impairment and contraindicated if GFR<15).

Nightingale JM et al. (2014) Effect of omeprazole on intestinal output in the short-bowel syndrome. Aliment Pharmacol Ther 5: 405-412





Fluid Calculated from previous day's losses.

Sodium 100mmol for every litre of previous days intestinal losses, plus

80mmol

Potassium 60-80 mmol daily Magnesium 8-14 mmol daily

Calories, protein, vitamins, trace elements - if enteral absorption inadequate.

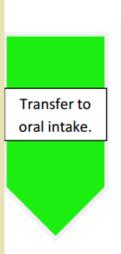
· Daily Bloods

• Daily weight - 1KG = 1L

 Consider Gastric anti-secretory drugs – PPI. Lansoprazole 30mg BD (maximum effective dose.) If after 72 hours change to Omeprazole 40mg

Fukumoto S et al. (2014) Renal magnesium wasting in a patient with short bowel syndrome with magnesium deficiency: effect of 1 alpha-hydroxyvitamin D3 treatment. J Clin Endocrinol Metab 65: 1301-1304





Stage Two When patient able to tolerate diet and stoma output above 1.5L/24 hours

- Continue I.V maintenance therapy
- Begin Low fibre diet
- Start Loperamide 4mg QDS to be taken 30 minutes before meals
- Commence on 1 litre of oral rehydration sol St Marks. (See separate sheet for formula). Discourage drinking 30 minutes before, during and after meal times. (Sauces, gravy, custard and sips of rehydration solution, may be taken with meals.
- Restrict the intake of non-electrolyte drinks to 500ml daily
- Encourage sodium rich snacks and sip feed drinks within fluid restriction
- Consider the need for enteral tube feeding
- Consider oral magnesium oxide capsules 12-16 mmol daily
- · If intestinal losses remain high, begin Octreotide
- Gradually withdraw I.V therapy

McIntyre PB et al. (2016) Patients with a high jejunostomy do not need a special diet. Gastroenterology 91: 25-33



STAGE 3: REFER TO NUTRITION TEAM for additional treatment if HOS continues

- loperamide dose can be increased by 2-4mg (re-assess every 2-3days. Only increase further if a significant improvement in output is seen. Maximum dose is 24mg QDS).
- If stoma output remains >2000ml daily after 2weeks of therapy initiate octreotide 200microgrammes TDS for 3-5 days. If no significant improvement stop. If improvement consider longerterm analogues.
- Review compliance to oral fluid restriction and St. Marks solution.
- Continue strict monitoring (fluid balance charts, weights, weekly magnesium levels).

Arenas Villafranca et al. Nutrition Journal (2015)



Management of Fluid and Electrolytes

Stage 1: Initial Management: Reduce Fluid and Electrolyte Losses:		
Review oral fluid intake	Rationale	
Restrict ORAL FLUIDS (such as water, tea, squash) to 500ml daily.	Fluids with a sodium concentration of <90mmol/l will cause a net secretion of sodium from the blood to the gut lumen and this is lost via the stoma (Fordtran et al, 1965, Rodrigues C et al, 1988).	
If stoma output is >3000ml/day place the patient NBM for 24hours to assess gastrointestinal secretion.	Gastrointestinal secretions (4000ml/24hrs) will be reduced with no oral intake. This may be beneficial as a short term measure, if initial stoma output is >3000ml daily. This will help improve hydration status and also assess if the high output is due to excessive secretion of gastrointestinal fluids.	
Review the need for intravenous fluids to	lleostomy output can contain 140mmol of sodium	
maintain hydration and replace stoma losses. Fluids with adequate sodium should be given in depleted patients.	per litre (Lee et al, 1974).	
If high stoma losses continue on antidiarrhoeal medication, commence St. Marks glucose-electrolyte replacement solution 1000 ml daily, orally (See appendix 5 & 6)	There is a coupled absorption of glucose and sodium in the jejunum (Olsen, 1968). Sodium concentrations >90mmol/l result in sodium absorption and improve sodium balance (Newton et al, 1985, Nightingale et al 1992).	
If compliance to St Marks is a problem – liaise with the Nutrition Team as other options may be suitable	St Marks solution does not reduce stoma volume per se when compared to the same quantity of water consumed (Nightingale et al, 1992) It improves sodium balance, which in turn improves	
NB - St Marks solution should not be given in unrestricted amounts as excess consumption will still increase stoma volume.	thirst, so that overall fluid intake can be reduced (when used in conjunction with a hypotonic fluid restriction). This will then reduce stoma output.	
	In patients with very short proximal lengths of bowel (<50cm to stoma) total fluid volume, including St Marks should be restricted if stoma output needs to be controlled.	
Ongoing need for Intravenous replacement of fluid, sodium (and other electrolytes) must be considered. Some patients may require ongoing/home IV fluids or home parenteral	To prevent electrolyte abnormalities and renal impairment.	
nutrition (ref to Nutrition Support Team. Appendix 4		



Medication to Reduce High Output Stoma Volume

Stage 1: Commence anti-diarrhoea medication	Rationale
Commence loperamide 4mg QDS to reduce stoma losses. This should be given 30-60minutes prior to meals and at bedtime (if using capsules open and mix with jam/yogurt).	Loperamide can reduce intestinal motility and thus decrease ileostomy output by 20-30% (Newton, 1978). Loperamide has benefits over codeine phosphate and should therefore be the first choice of anti-diarrhoea medication (Loperamide is not sedative, addictive and does not cause fat malabsorption).
NB This may not be effective in patients with very short bowel (<50cm to stoma).	
Review medication and aim to stop any medications which can increase stoma output (such as prokinetics).	
Stage 2: Optimise treatment - Anti- secretory, anti-diarrhoeal medication	Rationale
Increase loperamide dose to 8mg QDS.	Loperamide doses above recommended and licensed doses are often needed in patients with intestinal failure, as absorption is reduced (both due to reduced surface area and altered enterohepatic circulation). Higher plasma levels are needed to control a high output stoma than in the treatment of acute diarrhoea.
Review proton-pump inhibitors. Give Esomeprazole/Omeprazole 40 mg OD (increasing to BD if out remains above 2000ml/d when other measures above in place).	Omeprazole has been shown to reduce jejunostomy output. (Nightingale, 1991b, Jeppesen et al, 1998). This can be given orally if >50cm jejunum remains, as it is readily absorbed in the duodenum and upper small bowel (by giving omeprazole, gastric secretion is reduced, decreasing the osmotic pressure on the intestine).
Add in codeine phosphate 15mg – 60mg QDS, 30-60minutes prior to meals.	Codeine phosphate in combination with loperamide reduces stoma volume. It should be used cautiously in patients with renal impairment and is contraindicated in patients with GFR <15.
Stage 3: Increase medication and evaluate efficacy of other options	Rationale
Increase loperamide dose by 2-4mg (effect of this should be assess for 2-3 days before increasing the dose further as significant additional benefit may be unlikely above 8mg QDS). Maximum dose 24mg QDS.	Loperamide doses above recommended and licensed doses are often needed in patients with intestinal failure. BSG guidelines recommend a maximum dose of 24 mg QDS (Nightingale and Woodford, 2006).but this should only to used in cases where the effect of low doses has been properly considered. Significant further benefit is often unlikely above 32mg daily (Carlson et al, 2010)
If stoma output remains >2000ml daily after 2 weeks of therapy try sub/cut octreotide 50-200microgrammes TDS. Give for 3-5 days. If no improvement stop.	Subcutaneous octreotide 50micrograms twice daily reduces ileostomy/jejunostomy outputs (Nightingale et al., 1989) by reducing salivary, gastric and pancreatico-biliary secretions and slowing bowel transit. Longer acting analogues may also be useful. It may not be more effective than high dose loperamide and a proton pump inhibitor so these options should be considered first.



Nutritional Support for Adult Patients with a High Output Stoma

- This patient population is at risk of malnutrition due to their underlying disease process (cancer, inflammatory bowel disease) and treatment (often referred after surgery where nutritional intake has been compromised).
- 2) All patients should be nutritionally screened on admission to hospital and monitored regularly as per UHL policy. If patients are unable to meet their nutritional requirements orally, Enteral/parenteral nutrition should be considered. Refer to the Dietetic department or nutrition support team for assessment.
- 3) If patients are unable to maintain their nutritional status due to an inadequate nutritional intake, naso-gastric feeding should be considered. Enteral feeding formulations are low in sodium and normally need to be given in volumes of 1 -2 litres/day. This will compound stoma sodium losses. Solutions with low sodium concentrations lead to net secretion of sodium (Spiller et al, 1987).
- 4) The sodium concentration of enteral feed may need to be increased if it is not possible to replace electrolytes by another means. The addition of sodium to enteral feeds, may increase the risk of feed contamination / infection. It is important to follow UHL guidelines on administration of additional sodium to enteral feeds.
- 5) For those patients where enteral nutritional support is deemed inappropriate (malabsorption will limit effectiveness of treatment and exacerbate stoma losses), Parenteral Nutrition should be considered. Patients should be referred to the Nutrition Support Team for assessment.

Gallagher ND, Harrison DD, Skyring AP: Fluid and electrolyte disturbances in patients with long-established ileostomies. Gut 3:219–223,2016

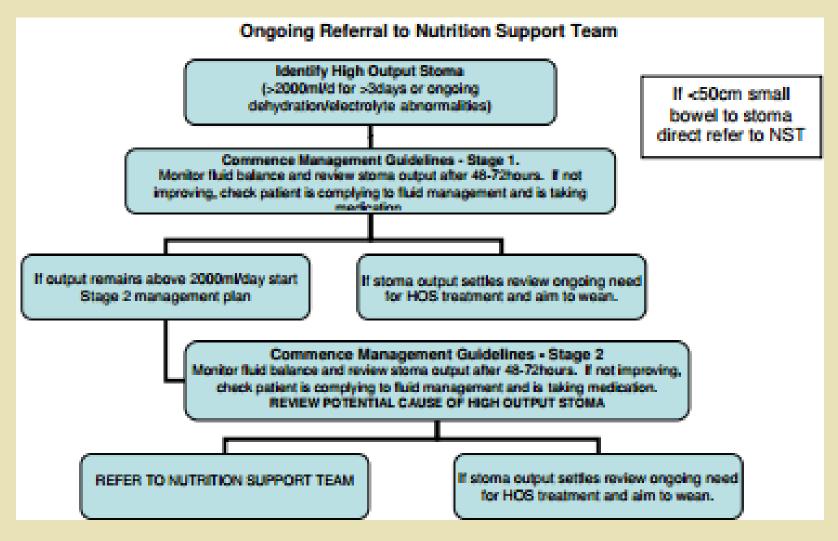


Monitoring patients with a High output stoma and ongoing referral

Parameter	Rationale
Ensure strict 24 hour fluid balance charts are completed.	To aid in the assessment of stoma losses and hydration status.
Assess compliance to hypotonic fluid restriction and St Marks solution.	Non compliance to oral fluid restriction causes dehydration (Baker, 2003).
Weigh patient DAILY.	Fluid balance charts derived from input-output charts are notoriously inaccurate, with no measure of insensible losses. Regular weight measurements are the best serial measure of fluid balance assuming 1kg = 1 litre (Lobo, 1999).
Monitor serum Urea and electrolytes, including magnesium.	To monitor hydration and electrolyte status
Monitor sodium balance once off IV saline. Check random urine [Na ⁺]: a level <20mmoVitre indicates sodium depletion.	Urine Na* < 20 mmol/l reflects avid renal sodium retention as a result of hypovolaemia (Kennedy, 1983).

Aziz A, Sheikh I, Jawaid M, Alam SN and Saleem M. Indications and Complications of Loop Ileostomy. Journal of Surgery Pakistan (International) July - September 2009; 14 (3); 128 - 131





Woolf GM et al. (2017) Nutritional absorption in short-bowel syndrome. Evaluation of fluid, calorie, and divalent cation requirements. Dig Dis Sci 32: 8-15



Treatment protocol for high output stomas (Continued)

Stage III. If HOS persists, evaluate treatment and case management

- Supplement with hydro- and lipid-soluble oral vitamins.
- Maintain loperamide and add codeine 15–60 mg. before breakfast-lunch-dinner.
 Contraindicated if the patient has CrCl <15 ml/min.
- If fat malabsorption persists, increase cholestyramine dose to 4 g before breakfast-lunch-dinner.
- If HOS > 2000 ml after two weeks: add octreotide 200 mcg/day for 3–5 days.
 If no improvement is obtained, suspend this treatment.
- Monitor fluid intake.

Specific nutritional treatment

- Avoid fluid intake during meals.
- It may be advisable to temporarily increase the salt content of foods in order to promote fluid reabsorption.
- Little is known about the use of soluble fibre. Insoluble fibre is contraindicated because of the risk of bowel obstruction.
- The effect of antidiarrhoeal microorganisms on HOS is unknown.

Field, Michael. "Intestinal ion transport and the pathophysiology of diarrhea." Journal of Clinical Investigation 111.7 (2013): 931-943.



Conclusion

- stoma-related complications would improve with time and that, 'the patients get used to their stoma'
- a protocol for response to HOS was designed
- Dietary modifications play an important role in decreasing the stomal output
- A jejunostomy tube placed for feeding should be clamped when not in use, not left to drain.
- A multidisciplinary team of surgeons, gastroenterologists, nutritionists and hospital pharmacists was established, approach is vital to enhance the quality of life of patients with an ostomy.

