

1. Introduction

This guideline sets out the identification and management of patients with a high output stoma including reducing and replacing fluid and electrolyte losses, drug management, nutritional support, and on-going monitoring of an adult patient with a high output stoma.

There is no universal definition for when a stoma is considered to have a high output. Historically in University Hospitals of Leicester NHS Trust (UHL) a high output stoma was defined as one which produces more than 2000ml/day (for more than 3 days), or one in which the volume has not been measured accurately or is producing less than 2000ml daily but there are on-going issues with fluid and electrolyte balance.

Newly formed stoma with outputs of >1200ml daily can also cause problems such as acute kidney injury and hyponatremia (sodium depletion) and often require patients to stay in hospital until outputs reduce and/or result in readmission. This guideline provides management guidelines for both groups.

2. Scope

2.1.1 This guideline applies to adult patients within UHL with an ongoing high stoma output, irrespective of the patient's clinical area or setting (inpatients, daycase, outpatients).

2.1.2 The aim of this document is to reduce complications of high output stoma by promoting evidence based practice amongst medical, nursing and health care professionals working with this patient population.

2.1.3 While the guideline is aimed at patients on surgical/medical wards, certain aspects (such as the use of medication to reduce intestinal losses) are transferable to other areas, such as critical care, oncology and medical admission areas.

2.1.4 The following professional groups are authorised to use this guideline:

- Surgical / medical teams
- Pharmacists
- Dietitians
- Nutrition Nurse Specialists
- Colorectal and Stoma Care Nurse Specialists.

3. Recommendations, Standards and Procedural Statements

3.1 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 (Nightingale, 2001). 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).

3.2 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).

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

- 3.4 Patients require a multidisciplinary team approach to management. Patients may require referral to the Leicester Intestinal Failure Team (LIFT) on ICE/NerveCentre. The majority of patients have a transient post-operative high output stoma that will normalise. Treatment though may be required long term or, in some cases until further bowel surgery is possible (to reverse the stoma).
- 3.5 These guidelines refer to stoma outputs of 1200 – 1800ml daily (A) and more than 1800ml daily (B). A patient with a newly formed ileostomy will be expected to produce between 500-2000ml daily (Condon, 1993). Adaptation occurs over weeks/months to produce a porridge-like stool of about 600ml daily (Hughes et al, cited Nightingale 2001). Volume of stoma output will be dependent on length of small bowel remaining and other factors (such as intra-abdominal sepsis).
- 3.6 Any patient with a stoma output of more than 1000ml daily should be referred to the stoma care nurses for advice on appliances / management. A well fitting appliance promotes skin integrity, allows for accurate recording of fistula/ostomy output, limits cross infection and reduces odour. It also avoids the use of dressings, maintains patient mobility, helps patients regain their confidence and quality of life as well as being a cost-effective procedure (Black, 2000).
- 3.7 Table 1 provides a general guide to when requirements for additional fluids/electrolytes and nutrition are required.

Table 1. Stoma Positioning and Requirement for fluids/electrolytes

Small bowel length to stoma. (daily volume)	Requirement for fluids and nutrition	Guideline
0-100cm (Expected volume 2-4litres daily)	Parenteral Nutrition + additional saline (\pm Magnesium)	HOS (B) for stoma outputs >1800ml/day
101-150cm (expected volume > 2000ml daily)	May need IV fluid & electrolytes plus Oral glucose-electrolyte solution	
151-200cm (expected volume 2000ml daily)	May need IV fluid & electrolytes plus Oral glucose-electrolyte solution	
>200cm (If volume >2000ml daily)	Oral glucose-electrolyte solution (May need IV fluid & electrolytes)	HOS (A) for stoma outputs 1200 -1800ml/day
>200cm (volume >1200ml – 2000ml daily)	May require oral Glucose-electrolyte solution	
>200cm (but volume <1200ml daily)	Normal fluids and high salt diet should be sufficient	N/A standard care

Adapted from Nightingale & Woodward, 2006

- 3.8 Local and national data (Baker et al, 2016; Cunha et al 2015; Hayden et al, 2013) suggests readmission rates in the region of 20% after ileostomy formation due to complications of stoma outputs causing acute kidney injury. Education and training of patients and their carers is vital before discharge from hospital.

Procedures / Further Information	
No.	Action
1	Summary Guidance
2	Management of Fluid and Electrolytes in a patient with a high output stoma
3	Medication to Reduce a High Output Stoma
4	Nutritional Support for Patients with a High Output Stoma
5	Monitoring patients with a High output stoma and ongoing referral
6	Post Discharge Review Proforma
7	St Marks Solution Instructions

4. Education and Training

The professional staff authorised to use this guideline as detailed in section 2 must have received relevant training in this patient population and accept responsibility for updating knowledge and skills on a regular basis to maintain competence. LIFT offer regular training to teams such as colorectal surgical doctors and can provide training to relevant clinical areas / specialities on request.

5. Monitoring Compliance

What will be measured to monitor compliance	How will compliance be monitored	Monitoring Lead	Frequency	Reporting arrangements
Post-discharge follow up arrangements for those with a High output stoma	Audit (identified from those discharged on oral rehydration (St Marks) and/or loperamide dose above 12mmol QDS)	Clinical Lead LIFT	Annually	Via CHUGGS, CSI

6. Supporting References *Other references available on request*

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Nightingale JM, Lennard-Jones, JE, Walker ER, *et al.* Oral salt supplements to compensate for jejunostomy losses: comparison of sodium chloride capsules, glucose electrolyte solution, and glucose polymer electrolyte solution. *Gut* 1992;33:759–61.

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7. Keywords

HOS (High output stoma), LIFT (Leicester Intestinal Failure Team) ileostomy, Jejunostomy, Intestinal failure

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2017	V4	Melanie Baker	- Pathway for stoma outputs 1200 – 1800ml included - Guidance on post discharge follow up included - Second line oral rehydration Glucodrate use if non-compliance with St Marks and patient under the care of the Leicester Intestinal Failure Team (LIFT)
2013	V3	Melanie Baker	- Summary, traffic light sheet made clearer so that care increases in a step wise manner post audit. - Additional information included about other types of glucose-electrolyte solutions available (St Marks with sodium Citrate). - Additional clarification about use of St Marks solutions, especially in patients with very short remaining length of bowel. - Format changed in accordance with Trust policy.
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STAGE A1: Initial management

DO NOT INSTIGATE IN THE FIRST 48hours POST STOMA FORMATION

1. **Confirm stoma output is 1200 – 1800ml via STRICT 24hour fluid balance**
2. **Commence loperamide 2 mg 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).

Loperamide dose can be increased by 2mg QDS every 24hours. Review effect on stoma output before increasing to 8 mg QDS.

3. Monitor strict fluid balance, daily weights, and serum U&E, AKI staging, and magnesium levels. Supplement if required.
4. **Encourage normal oral fluids and a high salt diet.** Do not restrict hypotonic fluids or start oral rehydration initially. Refer to Dietitian if nutritional intake poor.

STAGE A2: Review after 3 days

If output <1500ml/d No further action

If output 1500-1800ml Follow below

If output >1800ml Follow HOS B guidance

1. If output >1500ml daily on 8mg loperamide QDS **review proton-pump inhibitors.** Initiate or change to Esomeprazole/Omeprazole 40 mg OD-BD to reduce volume of gastric secretions and stoma volume.
2. **Commence oral rehydration solution St Marks 1000ml daily and restrict all other fluids to 500ml daily.**
3. **Review:**
 - If output reduces aim to increase oral fluids gradually and reduce loperamide dose as output thickens.
 - If output remains >1500ml aim to maintain hydration and sodium balance off IV saline (urine output >1000ml daily and urine sodium > 20mmol/l).

If output > 3000ml place patient NBM for 24-48 hours to assess baseline gastrointestinal secretions. NB In patients with very short bowel <100cm to stoma d/w Leicester Intestinal Failure Team (LIFT). Total oral fluid restriction and reducing gastric secretions are key

DO NOT INSTIGATE IN THE FIRST 48hours POST STOMA FORMATION

CHECK FOR SEPSIS, SUB ACUTE OBSTRUCTION, STEROID WITHDRAWAL AND INFECTION (Send culture) AS POTENTIAL CAUSES.

STAGE 1: Initial management – Reduce fluid and electrolyte losses

- **Restrict ORAL FLUIDS** to 500ml daily.
- **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)
- Monitor strict fluid balance, daily weights, serum U&E, AKI staging and magnesium levels. Supplement fluid and electrolytes IV as required.

Review stoma output after 48 hours – if output now <1800mls increase oral fluid intake and follow plan A

STAGE 2: Ongoing output >1800ml/day – optimise treatment with anti-secretory / diarrhoeal medication

- Continue oral fluid restriction and check compliance.
- **Commence St Marks oral rehydration** solution 1000ml daily, 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).

STAGE 3: REFER TO LIFT on ICE 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 but >12/16mg QDS rarely required).
- If stoma output remains >2000ml daily after 2weeks of therapy can trial octreotide 200microgrammes TDS for 3-5 days. If no significant improvement stop. If improvement consider longer-term analogues.
- Review compliance to oral fluid restriction and **St. Marks solution.**
- Continue strict monitoring (fluid balance charts, weights, weekly magnesium levels).

1.1 The initial management of a high output stoma should concentrate on reducing fluid and electrolyte losses. Restricting oral intake is the main stay of treatment, with intravenous replacement of fluid and electrolyte losses as required.

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 (Rodrigues C <i>et al</i> , 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 maintain hydration and replace stoma losses. Fluids with adequate sodium should be given in depleted patients.	Ileostomy output contains approximately 100mmol of sodium per litre (Nightingale, 2021)
If high stoma losses continue on antidiarrhoeal medication, commence St. Marks glucose-electrolyte replacement solution 1000 ml daily, orally (See appendix 5) NB - St Marks solution should not be given in unrestricted amounts as excess consumption will still increase stoma volume.	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 (Nightingale <i>et al</i> 1992). St Marks solution <u>does not</u> reduce stoma volume per se when compared to the same quantity of water consumed (Nightingale <i>et al</i> , 1992) It improves sodium balance, which in turn improves 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 nutrition (ref to Leicester Intestinal Failure Team) Appendix 4	To prevent electrolyte abnormalities and renal impairment.

1.2 Oral Rehydration Solutions

- a) Compliance to oral electrolyte solutions can be a problem.
- b) First line oral rehydration is St Marks Solution 1000-2000ml given daily. If compliance to taste is an issue in long term use than the sodium bicarbonate can be replaced with an equivalent amount of sodium citrate.
- c) Dioralyte is not recommended as first line due to the cost and low sodium content – it needs to be given at double strength (10 sachets In 1000ml) and this can lead to problems with hyperkalaemia.
- d) Isotonic re-hydration fluids such as Lucozade should not be used to replace St. Marks Solution as the sodium concentration is too low.

1.3 Management of electrolyte abnormalities.

Electrolyte abnormalities are common in patients with a high output stoma, particularly hypomagnesaemia. Magnesium deficiency occurs due to a combination of factors:

- a) Bowel Resection – Magnesium is normally absorbed by passive diffusion in the small bowel and colon. Resections reduce the absorptive area, although Mg balance is not related to the length of bowel remaining.
- b) Fatty Acids – from dietary fat or bacteria fermentation of unabsorbed carbohydrate, bind with magnesium and prevent absorption.
- c) Dehydration – Loss of salt and water causes hyperaldosteronism, which increases the absorption of sodium at the expense of Potassium and magnesium (increased renal excretion of magnesium).
- d) Vitamin D – if hypomagnesemia persists then check serum Vitamin D levels.

Magnesium should be supplemented following UHL Hypomagnesaemia guidelines (UHL Ref C10/2002)

Stage 1: Commence anti-diarrhoea medication	Rationale
<p>Commence loperamide 4mg QDS to reduce stoma losses.</p> <p>This should be given 30-60minutes prior to meals and at bedtime (if using capsules open and mix with jam/yogurt).</p> <p>NB This may not be effective in patients with very short bowel (<50cm to stoma).</p>	<p>Loperamide can reduce intestinal motility and thus decrease ileostomy output by 20-30% (Kristensen et al, 2017) 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).</p>
<p>Review medication and aim to stop any medications which can increase stoma output (such as prokinetics).</p>	
Stage 2: Optimise treatment - Anti-secretory, anti-diarrhoeal medication	Rationale
<p>Increase loperamide dose to 8mg QDS.</p>	<p>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.</p>
<p>Review proton-pump inhibitors.</p> <p>Give Esomeprazole/Omeprazole 40 mg OD (increasing to BD if output remains above 2000ml/d when other measures above in place).</p>	<p>Omeprazole has been shown to reduce jejunostomy output. (Jeppesen <i>et al</i>, 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).</p>
<p>Add in codeine phosphate 15mg – 60mg QDS, 30-60minutes prior to meals.</p>	<p>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.</p>
Stage 3: Increase medication and evaluate efficacy of other options	Rationale
<p>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.</p> <p>If stoma output remains >1800ml daily after 2 weeks of therapy try sub/cut octreotide 50-200microgrammes TDS. Give for 3-5 days. If no improvement stop.</p>	<p>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 Woodwood, 2006) but this should only to used in cases where the effect of low doses has been properly considered. Care is needed with high doses due to possible cardiac arrhythmias (MHRA 2017)</p> <p>Significant further benefit is often unlikely above 32mg daily (Carlson et al, 2010)</p> <p>Subcutaneous octreotide 50micrograms twice daily reduces ileostomy/jejunostomy outputs (Nightingale <i>et al</i>, 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.</p>

- 1) 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.(Nutritional Screening and First Line Oral Nutritional Care Policy for Adults. Trust Ref B26/2015). If patients are unable to meet their nutritional requirements orally, enteral/parenteral nutrition should be considered and the patient referred to the Dietetic department ICE/Nerve Centre for assessment.
- 3) 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 Leicester Intestinal Failure Team (LIFT) Nutrition Support Team for assessment via ICE/Nerve Centre.
- 4) 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).

4.1 Monitoring is vital to assess compliance and effectiveness of treatment.

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). The LIFT Nutrition Team can support with methods to improve compliance.
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 <20mmol/litre indicates sodium depletion.	Urine Na ⁺ < 20 mmol/l reflects avid renal sodium retention as a result of hypovolaemia (Kennedy, 1983).

- 4.2 To assist with compliance by patient and health care professional involved in the care of a patient with a high output stoma a ward based management guide is available (see page 3 & 4 Summary Guidance on the Management of a High Output Stoma. These should be used to reduce the risk of different teams/individuals giving different advice especially around the use of St Marks and hypotonic fluid restrictions. Patient information leaflets are also available (Managing with a High Output Stoma).
- 4.3 Local audit has identified that approximate half of patients presenting with a high output stoma settle within 2 weeks (Baker *et al*, 2010). Patients with small bowel lengths of <150cm are likely to have ongoing problems with a high output stoma. The need for antimotility drugs, hypotonic fluid restriction and electrolyte replacement should be titrated depending on stoma output/consistency and serum/urine measurements.
- 4.4 Local and national guidance suggests 20% of ileostomy patients are readmitted due to acute kidney injury and hyponatraemia following hospital discharge. All patients should be educated on signs and symptoms of dehydration and methods to replace fluid and sodium losses. Patient information sheets are available. On discharge from hospital patients should have an appropriate plan for follow-up in place. This should involve regular biochemical monitoring (via GP) and clinical review. The LIFT can offer ongoing monitoring via outpatient clinics in required.

Post Hospital Discharge monitoring for those with a High Output Stoma (or post readmission with AKI)

Monitor serum biochemistry	U&E, Magnesium 1 – 2 weeks post discharge. If show signs of AKI, hypernatremia clinical review required (see appendix 6 for proforma
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Patient Name:
S Number:
Date of Birth:



Surgical Procedure:

Date of Surgery:

Length of small bowel
Relevant PMHx

Relevant issues related to stoma function during hospital stay:

High output stoma Yes / NO

Discharged on medication YES / NO

Current Medication Regime:

- PPI: YES / NO Regime:
- Loperamide: YES / NO Dose:
- Codeine: YES / NO Dose:
- Hypotonic Fluids (Volume per 24 hours):
- Oral Rehydration solution: YES / NO Volume per 24 hours:

Measure the following ingredients :

- | | | |
|------|-------------------------------|--|
| 20g | Glucose powder with vitamin C | - SIX level 5ml spoonfuls |
| 3.5g | Table Salt | - ONE level 5ml spoonful |
| 2.5g | Sodium bicarbonate powder | - ONE heaped 2.5ml spoonful or half a 5ml spoonful |
- 1 Litre Water

Directions

- 5ml spoon is equivalent to a standard tea spoon
- Mix to dissolve all powder ingredients in one litre of water.
- Use within 24 hours and discard any remaining solution after this time.
- This solution may be diluted with a little fruit squash and refrigerated to make it more palatable (make sure the total volume of water and squash is one litre).
- Glucose powder and sodium bicarbonate powder (also known as bicarbonate of soda) is inexpensive and can be bought from any chemist or is available on prescription from GP.
- Standard table salt available from any supermarket is suitable for use.
- In an emergency situation double strength Dioralyte may be used as a substitute.

Drink litre(s) of this mixture throughout the day.

If you need to get these prescribed please show your GP/Doctor this leaflet. They will need to be prescribed in the following way.

St. Marks electrolyte mix

Formula	Glucose	20g	
	Sodium chloride	3.5g	
	Sodium bicarbonate	2.5g	Made up to 1L with tap water daily

Supply	Glucose powder with Vitamin C	500g
	Sodium chloride powder (table salt)	500g
	Sodium bicarbonate powder	100g

If the prescription is written in this way, your community pharmacist can claim for these items and will be able to supply them to you.

If you have queries, contact : _____