

# The Use of Oral Rehydration Solutions for the Management of High Output Stomas and Fistulas

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Oral rehydration solutions (ORS) are fundamental to aid fluid balance in patients with a short bowel (SB), especially for those with a high output stoma or fistula. By optimising the use of ORS, it may reduce the symptoms and signs of dehydration, and in some allow the parenteral fluid requirements to reduce or stop.

## Key points

1. Patients with high output stomas or fistulae (from a short bowel [SB]) may be at risk of dehydration, acute kidney injury and hypomagnesaemia.
2. Patients with a jejunostomy, ileostomy or with only a small portion of colon in continuity with a short length of SB may benefit from an ORS.
3. Jejunal mucosa has leaky intercellular junctions, so sodium and water diffuse into the lumen, giving a luminal sodium concentration of about 100 mmol/L (range 80–120) and an osmolality of about 300 mOsm/kg.
4. Glucose is absorbed, with sodium, in the small intestine via the active sodium–glucose cotransporter (SGLT1). This co-transport creates an osmotic gradient that draws water into the intestinal cells and, ultimately, into the bloodstream.
5. Patients with a high output from their stoma or fistula should be given an oral fluid allowance of 0.5–1.0 L of hypotonic fluid per day and prescribed an additional 1 L of ORS per day.
6. ORS contain a mix of glucose and sodium to maximise sodium and water absorption. A solution with a sodium concentration of approximately 90–120 mmol/L is required.
7. To make 1 L of St Mark's solution, mix 3.5 g of sodium chloride, 20 g of glucose powder, and 2.5 g of sodium bicarbonate (or 2.9 g sodium citrate). This solution has an approximate concentration of 90 mmol/L of sodium and 80 mmol/L of glucose.
8. ORS can be prepared using rehydration sachets, such as Dioralyte® (Sanofi), 8–10 sachets in 1 L of water. Since these sachets contain potassium, they should be used with caution in patients with renal impairment.
9. A glucose polymer (e.g. Maxijul®) in an ORS solution with a sodium concentration of 80–120 mmol/L allows more energy to be given. It may be beneficial in people with diabetes (less fluctuations in blood glucose) and in malnourished patients (more energy being given).
10. Sodium chloride capsules can be taken, but a large number are needed (e.g. 14 x 500 mg = 120 mmol) and they may cause nausea/vomiting.
11. Unlicensed 'special' pharmaceutical ORS products can be costly and difficult to obtain and are not recommended.
12. Isotonic sports drinks used as an ORS are not recommended in patients with a SB as the sodium concentration is too low and the glucose concentration too high.
13. An ORS should be specified in a patient's care plan. While a patient's taste for salt varies with their own sodium status, steps should be taken to try and improve the palatability of an ORS.
14. Healthcare professionals should monitor for symptoms, signs and investigation results that may indicate dehydration and sodium depletion.

## Explanations

- 1 & 2.** Patients with a high output stoma or fistula are vulnerable to dehydration, sodium and magnesium depletion (15–30% of patients with an ileostomy). The sodium concentration of jejunostomy/ileostomy output is about 100 mmol/L (range 80–140 mmol/L).
- 3 & 4.** Most oral hypotonic fluids (tea, coffee, orange juice, water) contain almost no sodium, so when in the jejunum, sodium moves from the plasma into the jejunal lumen until the concentration is about 100 mmol/L (lower near the duodeno-jejunal flexure and higher in the ileum). Also clinically relevant is the osmolality of the ingested solution, if hyperosmolar then water will move into the bowel lumen to achieve an osmolality of about 300 mOsm/kg. Against this potential movement of sodium and water into the lumen is the active SGLT1, which brings sodium and glucose out of the bowel lumen. It is because of this active transporter that glucose and sodium are given together. An ORS minimises sodium and water secretion into the bowel lumen, versus the losses that occur with administration of hypo- or hypertonic fluids. Increased losses make the patient feel thirsty and more dehydrated.

5. Hypotonic or 'low sodium' fluids, such as water, fizzy drinks, tea, coffee and juice will lead to an increase in sodium secretion (and water) into the bowel lumen to adjust to isotonicity exacerbating water and sodium depletion in patients with a SB. Thus, the amount consumed is restricted. Similarly, hypertonic fluids with a high sugar content will rapidly pass into the jejunum causing an efflux of water into the lumen to dilute to isotonicity. Their use is also restricted. Caffeine and alcohol also act as diuretics and can exacerbate dehydration in patients with a high output stoma and so should be limited.
6. ORS is composed mainly of glucose, sodium and occasionally potassium. Sodium and water absorption is promoted by SGLT1 in the intestinal epithelium. The glucose also serves to make ORS isotonic. An ideal ORS aims to have an osmolality of approximately 300 mOsm/L and a sodium concentration of 90–120 mmol/L.
7. St Mark's solution is a modification of the original World Health Organization (WHO) cholera solution without the potassium chloride. In 2002, the WHO changed this solution to one containing less sodium. St Mark's solution has an osmolality of 285 mOsm/kg. See **Table 1**.

**Table 1: St Mark's solution formulation**

Components	Components potential ingredient choices
1. Glucose 20 g	Glucose powder BP <b>Six level 5mL spoonful's</b> Alternatively use the equivalent of 20 g glucose in the form of: <ul style="list-style-type: none"> <li>• Glucose/dextrose* tablets</li> <li>• Glucose/dextrose* liquid</li> <li>• Maxijul powder</li> </ul> Do <b>not</b> use sugar (sucrose).
2. Sodium chloride 3.5 g	Table salt or Sodium Chloride BP <b>One level 5 ml spoonful</b>
3. Sodium bicarbonate 2.5 g/ Sodium citrate 2.9 g	Sodium bicarbonate BP powder <b>One heaped 2.5 ml spoonful</b> Alternatively use: <ul style="list-style-type: none"> <li>• Baking powder/bicarbonate of soda</li> <li>• Sodium bicarbonate 500 mg capsules, open and dissolve 5 capsules</li> <li>• Sodium citrate BP powder <b>One heaped 2.5 ml spoonful</b></li> </ul>
4. Water	<b>Add to 1 Litre of cold tap water</b> and mix until powders are dissolved

\*: dextrose is the D isomer of glucose only

Note: Individual ingredients can be obtained from supermarkets, pharmacies or readily available online for less than a single NHS prescription charge. Measured spoons can be obtained from a pharmacy. It is best to use the actual weights of the powders.

8. Dioralyte® used at double strength (10 sachets dissolved in 1 L of water) provides 120 mmol/L of sodium and 40 mmol/L potassium. If this is not tolerated, then 8 sachets will meet the correct concentration if dissolved in 1 L of water. If alternative products are used, they should result in a solution with a sodium concentration of approximately 90–120 mmol/L. See **Table 2**.

**Table 2: Concentrations of suitable ORS formulas**

	Na+ (mmol/L)	K+ (mmol/L)	Glucose (mmol/L)	Volume (mL)
Original WHO formula	90	20	111	1000
St Mark's solution	90	0	111	1000
Double strength Dioralyte® (10 sachets)*	120	40	180	1000
O.R.S® tablets (16 tablets)	96	40	146	1000

\*Dioralyte sachets can be substituted for generic rehydration sachets produced in most supermarkets and pharmacies, provided they have a similar concentration of sodium and glucose.

9. Glucose polymers or even polysaccharides (e.g. rice powder as in Dioralyte Relief®) with a high concentration of sodium chloride (90–120 mmol/L) have been used successfully to treat severe diarrhoea in patients with normal intact bowels. Only a glucose polymer (Maxijul®) has been used successfully in patients with a jejunostomy. While other glucose polymers/polysaccharides/disaccharides may be successful, we are not currently recommending them as the SB length may result in less enzymes (e.g. sucrase–isomaltase) to break the molecules down to monosaccharides on the brush boarder for absorption. Due to this reduced enzyme activity, sucrose is not recommended instead of glucose. In addition, amino acid enhanced solutions (glycine or alanine) are not currently recommended.
10. Table salt can rapidly relieve cramps and salt capsules may be used instead of an ORS, but may be unpleasant to take. Magnesium preparations may also reduce the frequency of muscle cramps.
11. Unlicensed special pharmaceutical products, often referred to as 'specials', are medications that are specially manufactured when no licensed product meets the specific need. In the case of ORS, products are specially manufactured to contain the correct amounts of the individual components of a rehydration formula (e.g. St Mark's solution). This eliminates the need for patients to obtain and measure out each component; however, they are of a high cost and often difficult to obtain.
12. Using isotonic sports drinks with added table salt as an ORS is not recommended (e.g. Powerade™/Lucozade™). These drinks contain insufficient levels of sodium and higher concentrations of glucose. They may also contain sweeteners that alter osmolality and contribute to a higher output from a stoma or fistula.
13. Many ORS solutions available are not easy to drink, hence compliance can be challenging. Sodium bicarbonate can be replaced by sodium citrate (if available), which may reduce the bitter taste. A small amount of squash/cordial concentrate (maximum 25 ml per L) added to the ORS may improve the taste. As with ice cubes (if used), this should be added before the water that makes the total volume up to 1 L. The flavouring should not be added to each individual glass of ORS. Other measures to improve palatability include storing the ORS in the fridge, drinking when chilled, and sipping through a straw throughout the day. Patients should receive education and ongoing support from their healthcare professional on the use of ORS to maximise fluid absorption. They should be encouraged to discuss with their team if are unable obtain a regular supply, unable to drink the recommended amount or have stopped taking it. The team should ensure that if the patient is making up an ORS formula, they have the correct measuring tools (spoons, scales, jug, etc.). Patients could be encouraged to take their medications with an ORS to aid consumption.
14. Patients at home and on discharge must be educated to recognise dehydration symptoms (thirsty, sudden weight loss, passing little urine, faintness on standing). They should also recognise overhydration (sudden weight increase, oedema). Healthcare professionals should monitor patients for signs of dehydration, which may include sudden fluctuations in weight, low systolic blood pressure (with postural drop of more than 10 mmHg), downward trend in eGFR levels (raised urea/creatinine), low urine volumes (less than 800 ml/24 hr), a spot urinary sodium level of <20 mmol/L and a low serum magnesium level.

### Suggested reading

- Culkin A (2012). Variability in the content of oral rehydration solution used in intestinal failure may render it ineffective. *Clin Nutr (Supp)*.; 7(1): 58.
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- Nightingale JM (2022). How to manage a high-output stoma. *Front Gastroenterol*.; 13(2): 140-151.
- Nightingale JM (2023). Management of a high output stoma, jejunostomy or uncomplicated enterocutaneous fistula. In *Intestinal failure* (Ed Nightingale JMD). *Spring Nature*.; 631-649.
- Wall E (2020). ORS: the solutions to optimize hydration in short bowel syndrome. *Pract Gastroenterol*.; 196(3): 24-31.

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