Managing high-output stomas: module 1 of 3

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Module 1

- The physiology of the intestinal tract
- Release and absorption of digestive enzymes
- The normal absorption of electrolytes and nutrition
- The cause of dehydration and electrolyte imbalance in patients with high outputs
- Considerations of the patient with a high output in the management of nutrition and electrolyte replacement
- Product choice when managing a high output stoma and enterocutaneous fistula
- The presentation of two case studies to amplify the practicalities of difficult stoma and fistula management and the products that are regularly used

The management of patients with high output stomas and complex enterocutaneous fistula can be challenging. They require a lot of ongoing support including appliance changes, nutritional support and advice and psychosocial support. Due to the nature of this subject and the complexity of this group of patients, it was decided that an informative education programme made up of three informative modules would be published for nurses working within the field of stoma care and on colorectal surgical wards to help them develop insight and understanding of both the nutritional management and the nursing management of appliance changes to aid the nursing care they deliver to their patients.

Module 1

The stomach can hold up to 1.5 litres of fluid. It starts the process of digestion and delivers partly processed food at a controlled rate to the duodenum.

Normal physiology of the duodenum

The duodenum is 20–25 cm long and is the widest part of the small bowel. It is structurally the same as the jejunum but also contains Brunner's glands, which secrete bicarbonate (alkali).

Normal physiology of the jejunum and ileum

The jejunum is the proximal 2/5 of the small bowel. It is about 4 cm in diameter. Compared to the ileum, it has longer villi, a higher villus density (40/mm), many circular folds, is thicker, more muscular and more vascular and has fewer lymphatics.

The ileum is the distal 3/5 of the small bowel. It is about 3.5 cm in diameter and has smaller villi, a lower villus density (20/mm) and fewer circular folds. It is thinner and less muscular and has many lymphoid follicles.

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Table 1. Differences between the jejunum and ileum

Jejunum
More permeable to water, Na and Chloride Na adsorption: ■ Can only occur across a small conc gradient ■ Is dependent on water movement ■ Is coupled to glucose and amino-acid adsorption ■ Maximal Na absorption occurs when the luminal Na conc is 120 mmol/1
Ileum
Less permeable to water, Na and Chloride Na absorption: ■ Can occur across a large conc gradient ■ Is not dependent on water movement ■ Is not coupled to glucose and amino-acid absorption

Table 2.

	Volume (litres)	pH
Saliva	0.5	7
Gastric juice	2	2
Pancreatic juice	0.6	8
Hepatic bile	0.9	7
Total	4	

Protein absorption

There are two phases to protein absorption:

- Luminal digestion—gastric acid: denatures dietary protein, making it more susceptible to hydrolysis; gastric pepsins: break down protein into oligopeptides; pancreatic peptidases: convert oligopeptides into free AAs and small peptides
- Brush border hydrolysis/absorption.

Fat absorption

The three main dietary fats, triglycerides, cholesterol and fat soluble vitamins, are absorbed differently in the small bowel. Medium chain triglycerides are absorbed more directly (*Figure 2*).

Absorption of nutrients across the intestine

The adult small intestine varies in length from 275–850 cm from the duodeno-jejunal flexure. Short bowel syndrome

(SBS) is a form of intestinal failure and can be divided into anatomical and functional types (*Table 3*). Anatomical SBS occurs after extensive small intestinal resection and also applies to patients with a high output enterocutaneous fistula. It typically occurs when there is less than 200 cm of small bowel in continuity and the lack of functioning gut results in diarrhoea, weight loss and nutrient malabsorption. However, it is not until there is less than 50 cm of small bowel with colon in continuity or less than 100 cm of small bowel to an end stoma that patients will be dependent on parenteral fluids with or without parenteral nutrition for survival.

The definition of intestinal failure is the reduction of functioning gut mass to below the minimum necessary for the absorption of nutrients and/or water and electrolytes. The term SBS is used to describe an anatomically short bowel but can also be applied to patients with a high output fistula or stoma despite an adequate length of small intestine. These patients have functional SBS (*Table 3*). The key determinant is whether a patient can maintain a positive fluid or nutritional balance.

Salt and water losses in SBS

Sodium absorption is central to the absorption of most nutrients (see above). There is a specific Na+ transporter on the enterocyte basolateral membrane exporting Na+ from the cell (this is energy-dependent) and this pump maintains a low intracellular Na+ concentration.

The absorption of sodium from inside the small intestinal lumen can be: active transport—with glucose or AAs; passive diffusion—down a concentration gradient; permeation—diffusion between cells.

Patients with SBS have a high output; the higher the stoma output, the higher the sodium losses. These losses need replacing or the patient will become both salt and water deplete (*Figure 2*).

Oral rehydration therapy uses the interdependence of Na, water and nutrient (especially sugars) absorption to increase sodium and water absorption from the small intestine. This helps to prevent dehydration *(Figures 4a and 4b, overleaf)*.

Clinical presentation of SBS

The classical presentation of short bowel syndrome is a combination of weight loss and dehydration in a patient with large stomal or fistula output. When mild this may be indolent and simply present as dehydration (symptomatic and biochemical), usually with hypomagnesaemia. When severe, patients are dependent on parenteral fluids to maintain hydration on a daily basis and require additional electrolytes (especially magnesium), calories, protein and vitamins i.e. parenteral nutrition.

Patients with SBS usually have an insatiable thirst. Drinking gives some immediate relief, but results in increased output, which accentuates sodium and fluid depletion. Early signs of dehydration include lethargy, tiredness and headaches. Patients should also be told to note their urine colour and frequency.

Cramps can be severe and are caused by hypomagnesaemia with or without hypocalcaemia. Stomal magnesium losses are considerable, resulting in a negative magnesium balance. The hypomagnesaemia must be resolved first.

Table 3. Short bowel syndrome

Anatomical	Functional
<100cm small intestine to end stoma or to an enterocutaneous fietula	>200cm small intestine with a severe malabsorptive process (refractory sprue. chronic intestinal pseudo-obstruction syndrome, congenital villue hypoplasia)
<50cm smsll intestine and colon in continuity	

Table 4.

Group	Common	Uncommon
Small intestinal resections	Crohn's disease	Post irradiation enteritis
		Repeated surgery (surgical comps)
Massive intestinal resection	Infarction (SMA/SMV thrombosis)	SMA embolus
		Massive volvulus
		Desmoid tumour
EC fistula	High output	
Bypass surgery		Gastric bypass (obesity)

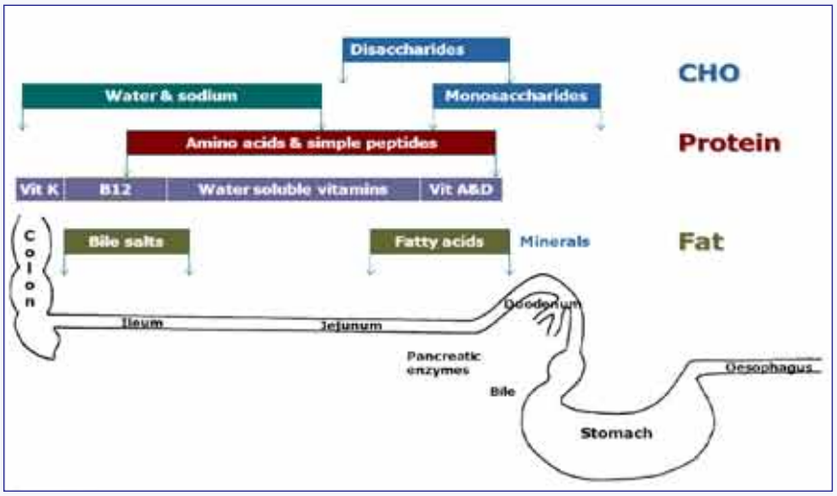


Figure 1. Location of absorption of nutrients across the intestine

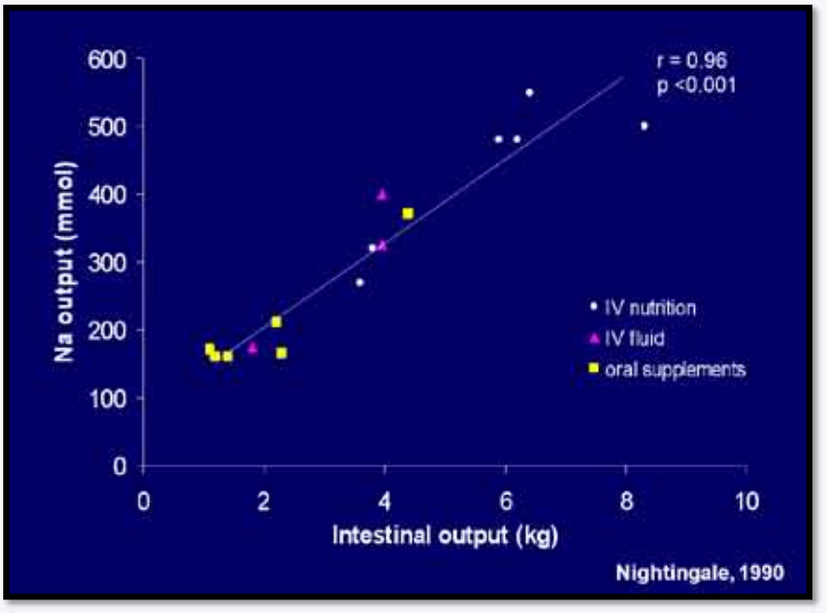


Figure 2. Location of absorption of nutrients across the intestine

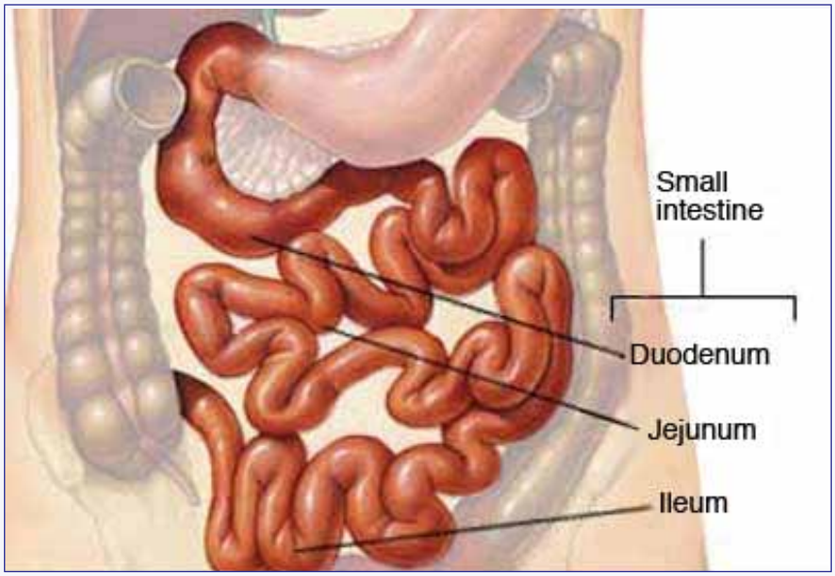


Figure 3. Normal physiology of the jejunum and ileum

Daily fluctuations in weight reflect fluid balance. Changes in weight over weeks reflect nutritional changes, thereby reflecting fat and protein reserves and must be monitored.

Patients often have problems with leakage or splitting of the bag as a result of a high stomal or fistula output. If the output is high, this is best managed using a high flow system.

Patients should be advised to drink little—1 litre per day of emix. Medications to decrease output include: omeprazole—40 mg BD: to decrease gastric acid secretions; loperamide—up to 16 mg QDS: decreasing intestinal motility; codeine phosphate—up to 60 mg QDS: decreasing intestinal motility; octreotide 100 mcg BD subcutaneously. Loperamide and codeine phosphate are best given 30–60 minutes before food.

Nursing management

Jejunostomy

A jejunostomy involves the jejunum being brought onto the surface of the abdomen and fashioned into a stoma. The reasons for carrying out a jejunostomy include: a mesenteric infarct, extensive small bowel surgery leading to multiple anastamosis requiring the intestine to be defunctioned above the point of surgery; and severe small bowel Crohn's disease.

Jejunostomies produce the highest stomal output—about 3-8 litres per 24 hours. It is therefore vital that stomal loss is monitored and recorded accurately. Most patients with a jejunostomy will require intravenous nutrition (Slater, 2012).

The nutrient and electrolytes required for metabolic and cardiac function, energy and repair are absorbed in the jejunum (apart from the remaining sodium that is absorbed in the colon and vitamin B12 in the terminal ileum). It is important to monitor levels regularly so that issues around stomal loss, absorption and replacement can be addressed (Lloyd et al, 2006).

Jejunostomies are fashioned within the upper right quadrant of the abdomen. They can be on the left if the surgeon can mobilise the intestine enough to bring it out and through the abdominal wall onto the surface of the abdomen, which depends on the length of the intestine above the level of the stoma and the depth of the abdomen. It can be difficult to mobilise the bowel lower down, especially if the abdomen is distended and the bowel is oedematous or inflamed.

The consistency of faecal loss from a jejunostomy is loose and requires the patient to wear a high output drainable appliance. High output appliances have a 'tap' outlet. This enables the patient to attach a large drainage collector bag (with a 2 litre capacity) to the pouch. High output pouches are available in one and two pieces. Patients can choose to wear a standard pouch during the day that can be hidden under clothing.

Table 5.

Ingredients	Amount	Note
Glucose	20g	6 teaspoons
Salt	3.5g	1 level 5ml teaspoon
Sodium bicarbonate	2.5g	1 heaped 2.5ml teaspoon

Drink little hypotonic fluid	Maximum 1L/day
Drink little glucose-saline solution	Maximum 1L/day

	Na (mmol/l)	K (mmol/l)	Glucose (mmol/l)	Volume (ml)
WHO	90	20	111	1000
Electrolyte mix	90	0	111	1000
Dioralyte	60	20	90	200

Ileostomy

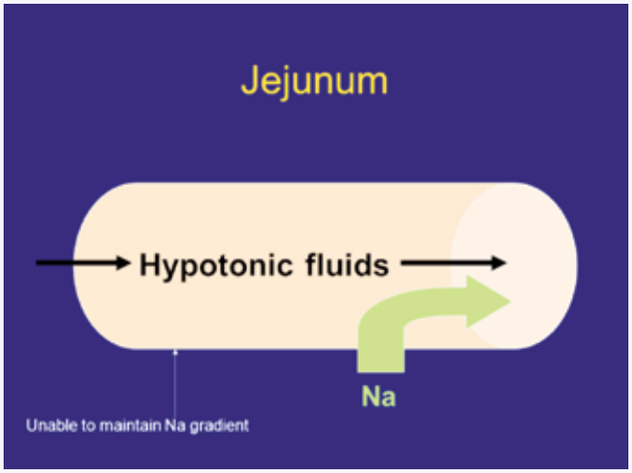
Ileostomy output is determined by where in the ileal tract it has been fashioned. It is normal for output to be high for a few days after surgery, but it rapidly decreases (Azzopardi and Ellul, 2011). Normal output from an ileostomy is about 1000 mls per 24 hours; a higher output than this will lead to dehydration and electrolyte imbalance. High output can occur for the following reasons: the length of small bowel up to the point of the ileostomy; a high oral hypotonic fluid intake; increased gastric secretions; sepsis or infection.

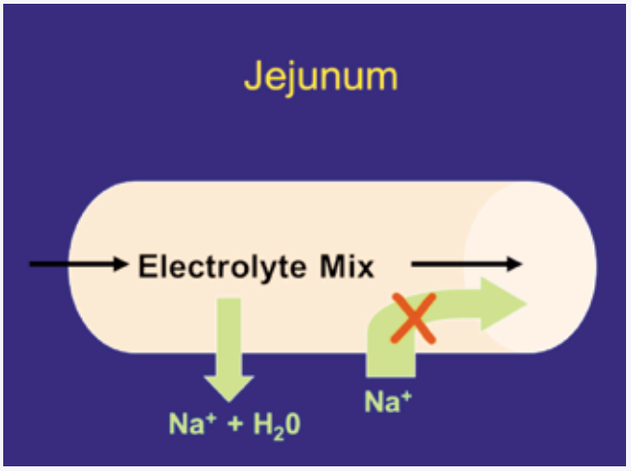
The initial priority in managing patients with high output ileostomies is to ensure that they are receiving and absorbing the right amount of nutrients and electrolytes to sustain a healthy metabolic balance and recover from surgery, but in the long term will not experience the negative effects of a continued high stomal output (Lloyd et al, 2006).

Medication can reduce stomal output but patients need to be educated on their intended action and how or when they should be administered. Alongside medication a low fibre and high starch diet and a high calorie intake are paramount to reducing stomal output. The intake of protein, often supplemented with enteral drinks, will improve the healing process. The gastroenterology team and a pharmacist will implement the changes necessary to manage electrolyte and nutritional requirements along with the medication used to aid a reduction in stomal loss.

Dieticians can educate patients and ensure that meal plans and snacks are available while they are in hospital. Stoma care nurses have a vital role in patient management and the use of appliances as well as educating patients and their carers on self-managment before they are discharged.

Due to the consistency of ileostomy output it is stipulated by Hall et al (1995) that the length of ileum fashioned into the stoma should be 2.5 cm to prevent contact of faeces with the skin thus preventing appliance leaks.





Figures 4a and 4b. Oral hydration therapy uses the interdependence of Na, water and nutrient (esp. sugars) absorption to increase sodium and water absorption

As the ileum does not absorb water and sodium, faecal output is of a porridge-like consistency. The amount of faecal output varies and is determined by the length of intestine proximal to the point of the stoma. Owing to output consistency, patients use a drainable appliance to enable them to empty it throughout the day without the need to remove it each time the stoma functions. The decision to wear a two-piece appliance is up to the individual but this can be recommended to those with an ileostomy if they wish to have a fresh pouch every day but do not want to remove the adhesive flange. It also allows the wearer to alternate between different size pouches to suit their social needs. Once a fluid restriction and dietary regime have been established all patients should have: a 24-hour fluid balance chart; daily weights; urine sodium once a week; biochemistry for absorption/dehydration analysis; a food chart.

Patients with a high output should maintain a high calorie intake. If they are being monitored on oral fluid and electrolyte solution with a high calorie, low fibre diet they should be referred to the dietician, nutrition team or pharmacist.

The volume of restriction is dependent on the total loss from the stoma or fistula. A standard oral solution volume and fluid restriction will usually be: 500 ml restriction of hypotonic fluids with a 1000 ml requirement of St Mark's electrolyte solution to compensate for a stomal/fistula loss of over 1500 ml/24 hours; 500 ml restriction of hypotonic fluids with a 500 ml requirement of St Mark's electrolyte solution for a stomal/fistula loss of up to 1500 ml/24 hours.

Drug therapy

The volume of stomal/fistula loss will determine the doses of medication used to reduce it. The standard doses are: omeprazole 20 mg twice a day 1 hour before breakfast and evening meal; loperamide 2mg four times per day at least half an hour before each meal. The dose is increased by 2 mg until the desired consistency of the stomal/fistula loss is reached and the output has reduced by about one-third; codeine phosphate 30 mg four times per day at least half an hour before each meal. The dose is increased up to 60 mg alongside loperamide to enhance the reduction of small bowel transit and thicken the consistency of the stomal/fistula loss.

Psychological support will help patients adapt to their condition and manage frequent appliance changes. They should be referred to a member of the phsychiatric medical team early for advice and counselling.

Appliance selection

There have been many developments to improve the choice of appliances for people living with a stoma. Pouches now aim to be discreet and easy to apply, remove or empty. The in-built filters are effective enough to allow the passage of flatus and ensure the pouch remains flat and that no odour is present. Filters are integral to all stoma appliances to expel the flatus that is passed via the stoma out of the bags. The filters are made from carbon (charcoal), which naturally deodorises the odour produced from the flatus. It is important to explain to the patient that the appliance is a sealed unit when secured onto the abdomen over the stoma and that an odour will only occur when the appliance is emptied.

It is important that individuals have an appliance that maintains their quality of life and suits aspects of their personal, work and social activities. To achieve this, stoma appliances should aim to eradicate leakage, stool seepage, odour and ballooning (Welser, 2009) ensuring the wearer has confidence in their product and returns to normal activities that they consider important to their quality of life.

The choice of appliance should be made by the patient, but guidance and suitability should be directed by the stoma nurse specialist. The stoma care nurse should ensure that the decision to trial an appliance is ethical and cost-effective.

All appliances, whether drainable or closed, are available in the following sizes: mini, midi and maxi, or, small, standard and large. High output pouches are only available in one size and hold about 700 ml. The wearer can choose an opaque or clear appliance.

Not all ileostomies have a good length of bowel as their stoma (known as the spout) and when this occurs convexity is used. Convexity is used to increase the protrusion of the stoma to reduce appliance leaks and ensure that the faeces drain into the bag and does not seep under the base plate (Cronin, 2008). The use of convexity that is integral in the base plate reduces the need for the patient to use adhesive

seals on the skin around the base of the stoma, simplifying the appliance change.

Convexity appliances are not as comfortable to wear as they are more rigid, but this can be a good thing as the patient has the confidence that the appliance is in place as they are aware of its presence adhering to their skin and this in turn improves confidence that their appliance will not leak.

One-piece appliances

The pouch is adhered to the adhesive flange (base plate) and the filter is positioned at the top on the front of the pouch. The positioning of the filter ensures that it does not get wet. A tough Velcro closure folds up until the pads meet.

One piece appliances have the following advantages:

- Appliance remains in place for a few days and the skin is left undisturbed (ileostomy)
- More cost-effective as an appliance is worn for about 3 days reducing the number of pouches used and base plates worn
- More flexible as less rigid, but not with the use of convexity
- Freedom to cut the template off-centre to adjust the height/position worn.

Two-piece appliances

A two-piece appliance has a base plate that adheres to the skin and the pouch attaches to the base plate by either a pairing of two rings that lock or by an adhesive boarder that sticks onto the base plate. A two-piece appliance prevents the peri-stomal skin from becoming excoriated from repeated removal of the adhesive pouch but also allows the patient to alternate the size of the pouch to suit leisure and social activities.

Two-piece appliances have the following advantages:

- Reduce the time taken to change an appliance as the pouch is removed from the base plate, the patient then wipes over any mild faecal soiling on the base plate and a new pouch is then adhered/clicked into place
- Ease of application as visibility on applying pouch is better
- Allows the wearer to place base plate according to shape and size of the abdomen
- Works well for individuals with a high output as they can alternate the type of pouch used during the day and night.

Mouldable technology/high output systems

Stomas change in shape and size throughout the day as the intestine contracts and expands to pass effluent or stool. ConvaTec Mouldable Technology™ may be useful in patients who experience frequent appliance leaks. As there is no need to cut out the adhesive boarder to fit the stoma it is also easy for patients with poor eye sight or dexterity to use.

Product accessories

Skin barrier products form a breathable, transparent coating that protects the skin from the corrosive alkaline output lost via the stoma/fistula. The products are pH balanced to make them hypoallergenic. Some barrier products increase the adhesion of the appliance and use of seals as they form a 'tachy' layer. Most products provide a protective layer that is permeable, allowing the skin to breathe for up to 72 hours. These include: Cavilon protective film and sticks; Ostomart Ostogaurd protective barrier wipes; Sorbaderm protective barrier film and sticks; Silesse protective barrier wipes.

Stomahesive paste is effective as a filler and sealant. It provides an excellent bond between the seals and the pouch/wound manager, but it must not be used directly on broken skin as it contains alcohol. Other pastes that do not contain alcohol are: Pelican paste; Eakin cohesive paste; Coloplast paste/strip paste.

Seals are used to 'fill in' and increase adhesion. Seals form a gel to release carbohydrate and in turn dilute digestive enzymes and alkaline output. They include: Pelican cohesive seals (small and large); Salts Secuplast seals (small and large).

Powder is effective for drying wet and excoriated skin. The powder acts as a barrier for the prevention of the erosive output contacting the skins surface or onto wounds. Powder is an excellent treatment for sloughy tissue within wounds or for peri-stomal cavities resulting from mucotaneous separation. When using within the junctional cavity for mucotaneous separation, the power forms a gel and this helps with tissue regeneration by desloughing the surface tissue that has died. These include: Ostomart OstoSeal protective powder; ConvaTec Orahesive powder; Coloplast Ostomy powder.

Retention strips and flange extenders are made of hydrocolloid or microporous material. They are designed to extend the width and adhesive layer of the appliance flange/base plate. Retention strips protect the edge of the appliance/base plate or wound manager when bathing or swimming and ensure the edge is water tight. These include: Ostomart Ostofix security tape (forty, eighty, straight tape); Coloplast elastic tape.

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Further reading

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