

Are oral nutritional supplements suitable as a sole source of nutrition in bolus feeding regimens?



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More than one in three tube fed patients now receive a form of bolus feed.¹ Bolus feeding is often an attractive option for patients over continuous pump feeding as it is more convenient and replicates meal times. Oral nutritional supplements (ONS) designed for oral use to supplement dietary intake, such as compact-style 2.4 kcal/ml supplements, are now frequently being used as a sole source of nutrition for bolus feeding.¹ Nutricia's Fortisip Compact and Abbott's Ensure Compact are both marketed as '*nutritionally complete in five bottles*' (for males 19-50 years); these ONS meet the minimum to maximum UK Reference Nutrient Intake (RNI) for micronutrients per 100 kcal, but not for the electrolytes sodium, potassium, chloride and magnesium.^{2,3}

The electrolyte content of ONS are purposefully kept low because they can adversely affect palatability and osmolarity. Manufacturers also have to consider other sources from oral intake and medications. With this in mind, this article looks to answer the question: *Are oral nutritional supplements suitable as a sole source of nutrition in bolus feeding regimens?*

The importance of electrolytes

The balance of serum electrolytes is essential for digestion, bone health, fluid balance, blood pressure control and cardiac muscle contraction.

An electrolyte imbalance can be caused by short-term illness, such as diarrhoea and vomiting; medications, such as diuretics and excess steroids; and underlying chronic disorders, such as cancer. Electrolyte imbalances could be made worse by inadequate nutritional intake.

Symptoms of electrolyte imbalance include: diarrhoea, constipation, abdominal pain, ileus, anorexia, polyuria and polydipsia, confusion and dizziness; and in severe deficiency: cardiac arrhythmia, tachycardia, respiratory depression, seizure and circulatory failure and collapse.⁴

Typical bolus feeding regimens

Compact ONS are frequently used for bolus feeding as, in practice, their compact style can reduce the incidence of nausea, reflux and vomiting. However, ONS have very low levels of electrolytes and do not meet RNIs.

Table One compares typical feed regimens (bolus and pump) against RNIs for electrolytes. All regimens provide ≥ 1500 kcal and ≥ 60 g plus of protein.

Products from Nutricia, Abbott and Fresenius-Kabi were selected for this research as they all provide community home enteral feed delivery services across the UK.

Table One shows that compact and larger volume ONS regimens do not meet RNIs for sodium, potassium or chloride in five bottles or 1500 kcal (neither do the tube feeds, but they do have a much better electrolyte profile). Many ONS do not even meet lower reference nutrient intakes (LRNI). The only electrolyte that the ONS (in **Table One**) achieve the LRNI for is magnesium, with the exclusion of Ensure Compact with just 5 mmol. The LRNI for magnesium for males is 7.8 mmol, for females 6.2 mmol.⁵

The RNI for sodium is 70 mmols/day.⁵ Unless clinically indicated, the Parenteral and Enteral Nutrition Group of the British Dietetic Association (PENG) recommend that enteral feed regimens should contain at least 50 mmols sodium per day.⁶ The National Institute

for Health and Care Excellence (NICE) recommend 1 mmol/kg body weight/day for sodium (as well as potassium and chloride).⁷ None of the ONS regimens achieve recommendations for sodium (assuming most adults would weigh more than 40 kg in view of NICE recommendations). However, of the compact ONS, Ensure Compact is significantly better and compares well to the larger volume ONS, with levels of sodium ranging between 34-44 mmol.

When comparing against RNIs, it is important to remember that RNIs represent the best estimate of the amount of a nutrient considered sufficient to meet the requirements of approximately 97% of 'a well population'.⁵ Dietitians treat people who may not fall under the category of a 'well population'. Some patients may have greater requirements due to the disease process, malabsorption and losses via fistula or diarrhoea. Others, for example the elderly, may suffer from chronically low levels of sodium. In these patient groups, using an inadequate feed may potentially result in a greater chronic deficiency and an increased risk of experiencing the complications outlined earlier.

The monthly cost of the feed regimens outlined in **Table One** have been included to enable cost comparisons for departments. In the future, dietitians may not only be looking at nutritional suitability, but also

at being able to demonstrate cost savings to clinical commissioning groups. When comparing the monthly cost of the feed regimens outlined here, those using compact and non-fibre ONS are the cheapest. Despite the cost of ONS increasing with the addition of fibre, fibre containing ONS regimens remain significantly cheaper than the tube feeds in **Table One**, by on average, £106/month.

As fibre content can often be overlooked in bolus feeding regimes, especially when tolerance is an issue, I have also compared the fibre content of ONS in **Table One**. For health, it is important to try and achieve recommended fibre intakes of 30 g per day.⁸ Nutricia have a compact ONS with fibre, which would be useful for patients who struggle to tolerate larger volume ONS. However, these contain 9 grams of prebiotic oligosaccharides and recommendations are 5-8 grams per day.⁹ Therefore, dietitians should recommend no more than 2/day² (Fortisip Compact Fibre also has the lowest levels of electrolytes of all the ONS compared here).²

The fibre content of larger volume 200/220 ml ONS compares well to the tube feeds in **Table One**, with 20-25 g and 23-26 g respectively, and are therefore a suitable option for patients able to tolerate larger volume ONS.

Other sources of electrolytes

For patients who use ONS to supplement oral intake, electrolytes can be obtained from diet and fluids. For patients who are nil by mouth the only other potential sources of electrolytes are from soluble medications and water flushes. However, the electrolytes obtained from these sources may be minimal and difficult for dietitians to quantify in nutritional comparisons. For example, there is approximately only 0.3 mmol of chloride in a litre of drinking water or water used for flushes,¹⁰ the RNI for chloride is 90 mmol/day,⁵ water supplies between geographical areas can also vary.

Should we change practice?

When considering this question, it is important to note that: 'Clinical guidelines are evidence-based statements developed to assist healthcare professionals in making decisions about how to optimise and provide appropriate nutritional care for patients...'¹¹ and that safe effective and good quality care is fundamental to dietetic practice.¹¹ Therefore, to reduce the risk and consequences of electrolyte deficiency, dietitians should aim to achieve RNIs when devising feed regimens.

Table One: Typical Feed Regimens

Type of Feed	Feed Name Typical regimen: 5 bottles/ 1500 ml - providing: ≥1500 kcal ≥ 60 g protein	Sodium LRNI - RNI ⁴ 25-70 mmol	Potassium LRNI - RNI ⁴ 50-90 mmol	Chloride LRNI - RNI ⁴ 50-90 mmol	Magnesium LRNI - RNI ⁴ Male: 7.8-12.9 Female: 6.2-10.9 mmol	Fibre 30 g	COST (£) 28 days supply
125 ml compact ONS non-fibre	Nutricia Fortisip Compact	26	38	16	9	0	203.00
	Abbott Ensure Compact	39	34	26	5	0	203.00
200/220 ml ONS non-fibre	Nutricia Fortisip Bottle	39	41	25	10	0	196.00
	Abbott Ensure Plus Milkshake Style	44	45	34	14	0	196.00
	Fresenius-Kabi Fresubin Energy	35	35	28	10	0	196.00
200 ml ONS with fibre	Nutrison Energy Multi Fibre Vanilla	39	41	24	10	22	306.60
	Abbott Ensure Plus Fibre	37	35	31	13	25	282.80
	Fresenius-Kabi Fresubin Energy Fibre	34	33	28	9	20	292.60
1500 ml tube feed with fibre	Nutricia Nutrison Multi Fibre	65	58	53	14	23	427.00
	Abbott Jevity	61	60	55	14	26	395.92
	Fresenius-Kabi Fresubin 1500 Complete	87	60	65	15	23	378.56

Notes: * The cost of 28 days supply calculated from FP10 prices shown in MIMS (Feb 2017). This does not include the cost of ancillaries, i.e. syringes or giving sets.

** All product information sourced from company product data sheets/compendiums (Jan 2017).

Some of my patients, who I know are not meeting electrolyte recommendations on regimens of compact-style supplements, have recently been admitted to hospital, therefore I have taken this opportunity to review their serum electrolyte concentrations. Results were variable, with sodium and potassium levels falling below and between local parameters. I cannot be certain that low concentrations were always due to feed, but where possible I have amended regimens to include 200 ml supplements to increase the patient's electrolyte intake to help correct any deficiencies.

Unfortunately, I have not been able to reassess serum electrolyte levels following hospital discharge as we do not routinely take blood samples from our home enteral feeding patients. I believe this raises ethical issues. Dietitians routinely request serum electrolyte concentrations for community patients on parenteral nutrition, so why not for those on enteral nutrition? For these patients, NICE recommends that patients and/or their carers are trained to monitor wellbeing so they can recognise any adverse changes that might be linked to nutrition support. In reality, I wonder how well this would work.

What should we recommend?

Although some bolus feed regimens are better than others for electrolytes, none meet RNIs and other recommendations outlined earlier.

For those patients who do not want to change to continuous pump feeding, dietitians could:

1. Use pump assisted feeding to deliver boluses, but this would require the patient to be attached to and operate a pump, which might have been the reason they initially chose to bolus ONS.

2. Recommend the use of bags of feed to be administered via a syringe, but this would not be near as easy or convenient as using ONS and if the feed was not stored properly it could increase infection risk.

3. Use ONS with the best electrolyte profile, i.e. 200/220 ml ONS and continue to liaise with feed manufacturers in the development of supplements that can be used solely for bolus feeding where palatability would not be an issue.

The challenges and practicalities of changing feed regimens in the community

It can be very difficult to negotiate a change in feed with a patient once they are established on a particular feed in the community. Some of my patients have been established on a feed for several years and have appeared very anxious when I have suggested changing it. It has also made me feel uncomfortable, and sometimes unprofessional, suggesting that the feed they may have been on for some time is not the best in terms of electrolyte and fibre content. (I appreciate that not all patients will have electrolyte deficiencies even on low intakes, but without access to regular blood samples I cannot always be sure of this). These discussions could potentially affect a patient's confidence in the dietitian and damage the patient-dietitian relationship. It is also challenging to suddenly increase fibre intake for risk of causing constipation.

If the patient does agree to a change in feed it is important to consider stock already in the home - do you use this up or potentially waste expensive stock? Then there is the extra work involved, i.e. additional home visits to ensure patients and carers are confident with the new feed

regimen, the updating of online ordering systems and clinical records, and new prescription letters will need to be written.

Conclusion

Due to the low levels of electrolytes in ONS currently available, ONS are not suitable as a sole source of nutrition in bolus feeding. However, due to an inability or preference not to use continuous pump feeding, the use of ONS for tube feeding may be necessary. Tube feeds come closer to meeting RNIs for electrolytes, but it is impractical to administer tube feed via the syringe method and, as research shows,¹ many patients don't want to be attached to or have to learn to operate a pump. For patients who chose to syringe ONS as their preferred feeding method, dietitians should aim to achieve evidence-based recommendations for electrolytes and fibre, where clinically indicated, and recommend larger volume 200/220 ml fibre containing ONS. As negotiating with a patient to change their feed regimen can be challenging, time demanding and potentially expensive, it is sensible and important to establish the best available feed regimen prior to discharge into the community. If feed volume is an issue, Ensure Compact has the best electrolyte profile of the compact-style ONS. For dietitians who use Nutricia's range of ONS a mix of Fortisip Compact +/- fibre and Nutrison Energy Multi Fibre Vanilla provides more sodium, potassium, chloride and fibre compared to regimens of Fortisip Compact. Dietitians can at their discretion recommend more than two Fortisip Compact Fibre per day, but this should be closely monitored and reduced if the patient experiences flatulence, distension or abdominal pain. With ONS being used for bolus feeding, improving electrolyte profiles is something nutrition companies may wish to consider.

Suggestions for further discussion/research

- Dietetic departments could discuss the routine monitoring of serum electrolyte levels in home enteral feeding patients during quality improvement and patient safety meetings
- An audit of home enteral feeding patient's serum electrolyte levels pre and post any changes to feed regimens, particularly those on ONS regimens.

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