

Date of preparation October 2021

British Intestinal Failure Alliance (BIFA) Position Statement

*Advice during a shortage of intravenous micronutrients for patients receiving parenteral nutrition

Authors:** Kirstine Farrer, Simon Harrison, Mel Baker, Akshay Batra, Sheldon C. Cooper, Alison Culkin, Simon Gabe, Simon Lal, Gavin Leahy, Hayley Leyland, Philippa Macelhinney-West, Uchu Meade, Dan Rogers, Venetia Simchowicz, Mia Small, Trevor Smith, Antje Teubner, Nick Thompson, Alison Young, Sarah Zeraschi and the BIFA committee.

**Competing interests: None declared

October 2021

Introduction

Many UK hospitals and HPN homecare companies are experiencing shortages or delayed deliveries for intravenous (IV) vitamin and trace element products used in the manufacture of parenteral nutrition (PN). This is a global issue and will not be resolved quickly. Due to a global cap on manufacture of competitor products, there is an inability to switch to an alternative. Hence there is an urgent need to prioritise the highest risk patients and/or to consider the use of oral preparations if clinically indicated and safe to replace IV products if no stock is available. Clinical teams remain responsible for prioritising care for their patients and this document offers guidance only.

We strongly advocate teams should only purchase their usual supply of vitamin and trace element vials as needed. In the interest of fair allocation to all patients nationally, please do not stockpile. We are aware many companies are not allowing excessive orders at present or taking on new contracts. Manufacturers should notify Trusts of any expected disruption or shortages in medication supply. Severe disruption must be escalated by the manufacturer to NHSE via reporting mechanisms of the Medicines Shortage Group of the Department of Health and Social Care. A reporting form can be found at psnc.org.uk. Trusts unable to source adequate supplies are directed to their regional pharmacy procurement lead who will co-ordinate mutual aid where possible.

The clinical impact of these shortages must be risk assessed within the context of business continuity plans. Individual patient harm related to shortages must be reported via your hospital incident reporting system and to the Chief Pharmacist.

**Disclaimer: BAPEN Position Statements/Guidelines have been prepared as guidance only to assist qualified healthcare professionals in the decision-making processes surrounding nutritional care. Users of these materials may only do so on the condition that they exercise their own professional knowledge and skills when applying such guidance to specific circumstances. Anyone without the appropriate qualifications must seek the advice of a qualified healthcare professional before taking, or refraining from, any action on the basis of the policies or guidance. BAPEN does not (i) owe a duty of care to users of the policies or guidance who are not qualified healthcare professionals; and (ii) cannot accept liability to anyone using these policies or guidance.*

BAPEN brings together the strengths of its Core Groups to optimise nutritional care



Date of preparation October 2021

Micronutrients in Parenteral Nutrition

Micronutrients are essential components of PN. Shortages of commercial products result in increased risk of deficiency. Even though there are recommendations to conserve supplies for those at highest risk, practices that provide no micronutrients or doses less than required are not safe. Serious complications can result from vitamin and trace element deficiencies, and this is especially problematic during times of product shortages.

Hence it is vital teams increase their awareness and assessment of signs and symptoms and laboratory evidence of micronutrient deficiencies.

Table 1 Micronutrient deficiencies – vitamins (1)

Vitamin	Effects of Deficiency
A	Xerophthalmia impaired dark adaptation, dry flaky skin, increased risk of infections
D	Osteomalacia in adults and rickets in children
E	Haemolytic anaemia in infants, central and peripheral neuropathy, reduced vision
K	Bleeding disorders /bone disorders
B1 thiamine	Beri-beri, Wernicke- Korsakov syndrome
B2 riboflavin	Lesions of the lips, tongue and skin
B3 pyridoxine	Anaemia in children, lesions on lips and tongue and skin
Niacin	Pellagra rash, weakness and diarrhoea
B12	Megaloblastic anaemia, demyelination
folate	Megaloblastic anaemia, growth retardation, pancytopenia
biotin	Sore mouth/nose, scaly dermatitis and hair loss
Vitamin C	Impaired wound healing

Table 2 Micronutrient deficiencies – trace elements (1)

Trace Element	Effects of Deficiency
Zinc	Growth retardation, diarrhoea, skin rash /dermatitis, immune deficiency, alopecia, anorexia, growth failure, delayed sexual maturation, reduced taste sensitivity, poor night vision, and impaired wound healing
Copper	Hypochromic microcytic anaemia, neutropenia, subperiosteal bleeding, myelopathy, sensorimotor neuropathy, optic neuropathy, cardiac arrhythmia Hypercholesterolemia may be observed. Children may exhibit skeletal demineralisation. In premature infants, signs may include depigmentation of hair and skin, aortic aneurysm associated with impaired elastin formation, central nervous system dysfunction, and hypotonia
Selenium	Skeletal myopathy, cardiomyopathy, poor cellular immunity, macrocytosis, haemolysis, pseudoalbinism. Deficiency usually takes years to develop in adults, but may occur sooner in neonates or may be due to losses with high output enterocutaneous fistulae.
Manganese	Lipid abnormalities, anaemia
Chromium	Glucose intolerance, weight loss, peripheral neuropathy
Molybdenum	Intolerance to sulphur amino acid, tachycardia, visual disturbances
Iron	Anaemia
Iodine	Hypothyroidism in adults, cretinism in children, goitre
Fluoride	Dental caries

BAPEN brings together the strengths of its Core Groups to optimise nutritional care



Date of preparation October 2021

Recommendations

During the IV vitamin and trace element shortage period, consider one or more of the following general measures:

1. Assess each patient as to the indication for PN and provide vitamins and trace elements via the oral or enteral route when possible and deemed to be safe. Many micronutrients are absorbed in the proximal small bowel such that patients may be able to absorb oral vitamins and trace elements, see figure 1 outlining the key gastro-intestinal sites for absorption.
2. Reserve IV micronutrient products for those patients receiving PN or those with a therapeutic medical need for IV vitamins/trace elements e.g.
 - Neonates.
 - Paediatric patients receiving PN and unable to tolerate oral / enteral micronutrients.
 - Adult and paediatric patients with inherited metabolic disorders.
 - Patients at extremely high-risk of refeeding syndrome when commencing PN, in line with local Trust policy.
 - Patients on PN requiring critical care.
 - Patients with intestinal failure unable to absorb any oral or enteral micronutrient preparations.
 - Patients on home parenteral nutrition (HPN) unable to absorb any oral or enteral micronutrient preparations or who are intolerant with confirmed side effects or allergic to oral or enteral micronutrient preparations.
3. Do not use paediatric IV micronutrients for adults, as this will deplete the UK stock of these products and paediatric patients have an even greater need for vitamins and trace elements to promote growth and development.
4. If IV multi-trace element products are no longer available, individual IV trace elements can be added to PN, liaise with pharmacist. However, this is dependent on individual aseptic compounding ability and capacity, it may be necessary to give separate micronutrient infusions at ward level or in the home environment for patients receiving HPN. This should be included as part of the risk assessment.
5. For patients with type 1 intestinal failure please consider swapping to oral /enteral micronutrient supplements when the clinical team considers it safe to do so e.g., patient resumes medications via the oral or enteral route, see figure 1, table 3 and 4 for guidance.
6. When all options to maintain stock levels of adult IV micronutrient products have been exhausted, ration adult micronutrient infusions e.g., give 2-3 times per week instead of daily and supplement with oral /enteral preparations - see table 3 and 4 for guidance.
7. Consider reducing IV adult micronutrient formulations to 1- 2 per week for HPN patients if there is no pre-existing deficiency especially if HPN support is supplementary to enteral intake. Consider adding this to Red/Amber/Green (RAG) rating for each patient.
8. For patients on HPN this may require more frequent monitoring of micronutrient levels as previously outlined in the BIFA position statements on monitoring micronutrients (3) especially if there is any clinical suspicion or concern of micronutrient deficiency.

BAPEN brings together the strengths of its Core Groups to optimise nutritional care



Date of preparation October 2021

Conclusion

These recommendations do not constitute medical or professional advice and should not be taken as such. The recommendations have been designed to help clinical teams rationalise the administration of IV vitamins and trace elements at a time of a national/international supply shortage; these recommendations should not be used at other times outside of this crisis.

To the extent that the information published herein may be used to assist in the care of patients, this is the result of the sole professional judgment of the attending health professional whose judgment is the primary component of quality medical care. The information presented herein is not a substitute for the exercise of such judgment by the health professional.

*Disclaimer: BAPEN Position Statements/Guidelines have been prepared as guidance only to assist qualified healthcare professionals in the decision-making processes surrounding nutritional care. Users of these materials may only do so on the condition that they exercise their own professional knowledge and skills when applying such guidance to specific circumstances. Anyone without the appropriate qualifications must seek the advice of a qualified healthcare professional before taking, or refraining from, any action on the basis of the policies or guidance. BAPEN does not (i) owe a duty of care to users of the policies or guidance who are not qualified healthcare professionals; and (ii) cannot accept liability to anyone using these policies or guidance.

References

1. PENG A Pocket Guide to Clinical Nutrition (2018) edited by V. Todorovic and Mafri B British Dietetic Association.
2. Mercer-Smith G et al (2021) BIFA guidance Haematological and Biochemical Monitoring of Adult Patients receiving Home Parenteral Nutrition. [position-statement-haematological-biochemical-monitoring-adult-hpn.pdf \(bapen.org.uk\)](https://www.bapen.org.uk/position-statement-haematological-biochemical-monitoring-adult-hpn.pdf)
3. British Association for Parenteral and Enteral Nutrition. Parenteral Nutrition Monitoring [Internet]. 2016. Available from: <https://www.bapen.org.uk/nutrition-support/parenteral-nutrition/monitoring>

BAPEN brings together the strengths of its Core Groups to optimise nutritional care



Date of preparation October 2021

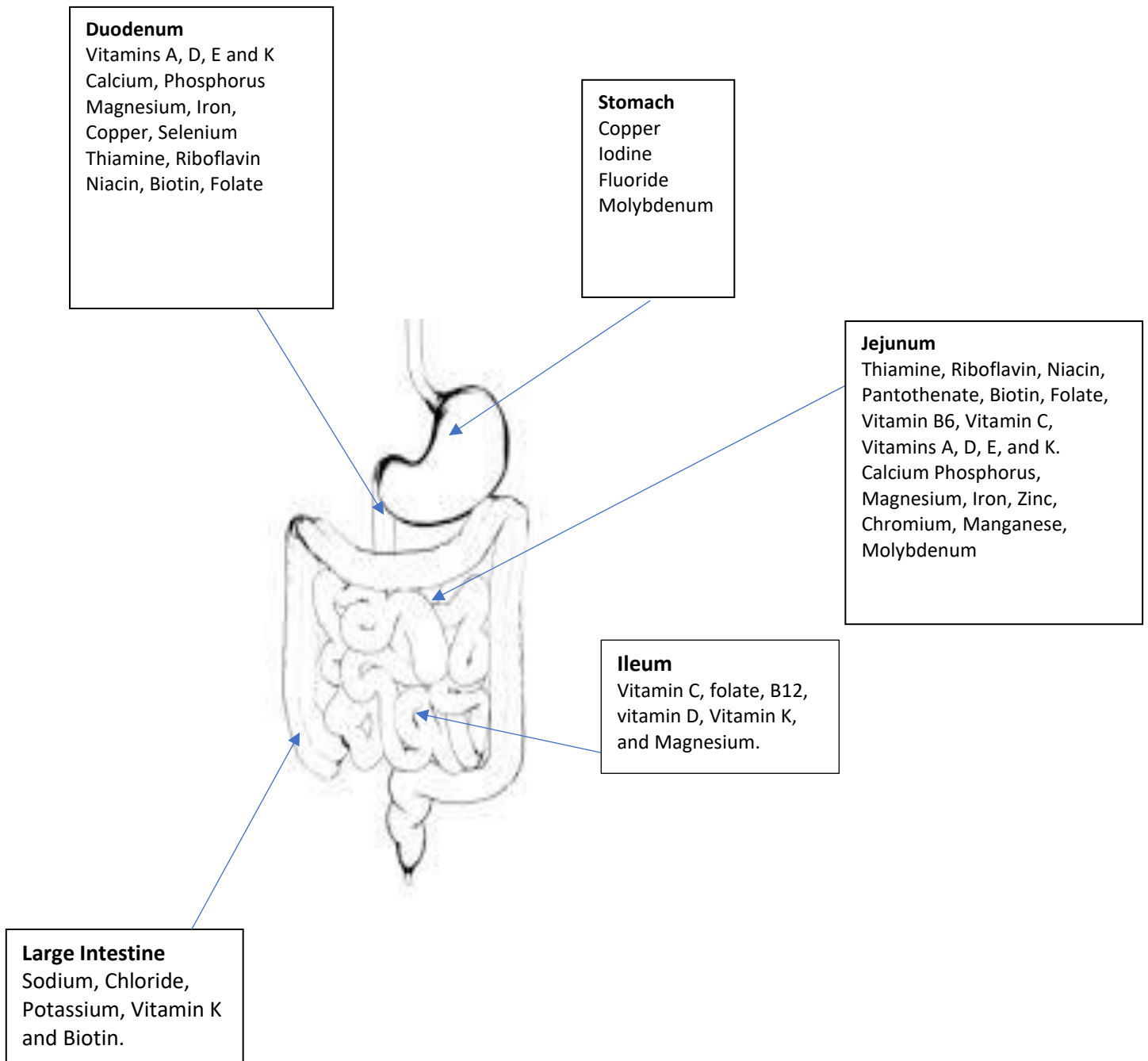


Figure 1 Site of absorption of micronutrients in the gastro-intestinal tract

BAPEN brings together the strengths of its Core Groups to optimise nutritional care



Date of preparation October 2021

Vitamin /Mineral	IV	IV	IV	IV	IV	IV	IV	IV	Enteral	Enteral	Enteral
	solovito Vialk (FK)	Vitlipid N Adult vial (FK)	Cernevit Baxter	Nutratain vial (Ebraun)	Addaven (FK)	Additrace (FK)	Nutryelt (Baxter)	Pabrinex (Contents of 1 pair of ampoules)	Forceval Soluble	Forceval	Vitamin B compound strong tablets
Vitamin B1 thiamine	2.5		3.51	6				250	1.2	1.2	4.85
Vitamin B2 Riboflavin	3.6		4.14	3.6				4	1.6	1.6	2
Nicotinamide B3 (mg)	40		46	40				150	18	18	20
Vitamin B6 pyridoxine	4		4.53	6				50	2	2	2
Pantothenic acid b5	15		17.25	15					4	4	
Biotin b7 (mcg)	60		69	60					100	100	
Folic acid b9 (mcg)	400		414	600					400	400	
Vitamin B12 (mcg)	5		6	5					3	3	
Vitamin C (mg)	100		125	200				500	60	60	
Vitamin A (IU)		3300	3500	3300					2500	2500	
Vitamin D2 (IU)		200							400	400	
Vitamin D3 (IU)			220	200							
Vitamin E (mg)		10	11.2	9.1					10	10	
Vitamin K (mcg)		150		150					0	0	
Zinc (mg)					5	6.5	10		15	15	
Selenium (mcg)					79	48	70		50	50	
Iron (mg)					1.1	1.1	1		12	12	
Copper (mg)					0.38	1.3	0.3		2	2	
Manganese (mg)					0.55	1.24	0.55		3	3	
Phosphorus (mg)					0	0	0		105	83	
Iodine (mcg)					130	127	130		140	140	
Chromium (mcg)					10	17	10		200	200	
Molybdenum (mcg)					19	23	20		250	250	
Calcium (mg)					0	0	0		120	108	
Potassium (mg)					<39	<39	<39		300	4	
Magnesium (mg)					0	0	0		56.25	30	
Sodium (mg)					<23	<23	<23		92	0	
Flouride (mcg)					950	950	950		0	0	

Table 3 Adult intravenous (iv) and oral micronutrient preparations

BAPEN brings together the strengths of its Core Groups to optimise nutritional care



Date of preparation October 2021

Vitamin	iv	Enteral	Enteral	Enteral
	Vitlipid N Infant vial FK	Forceval JUNIOR	Abidec drops	Dalavit drops paediatric
			7 essential vitamins for children. 1.2mls daily dose for in Cystic fibrosis not suitable for peanut /soya allergy	no peanut oil suitable for vegans /vegetarians and allergy to soya - 7 vitamins.
			*Below is based on 1.2ml dose	*below is based on 0.6ml dose
Vitamin B1 thiamine (mg)		1.2	0.8	1
Vitamin B2 Riboflavin mg		1	1.6	0.4
Nicotinamide B3 (mg)		7.5	16	5
Vitamin B6 pyridoxine (mg)		1	1.6	0.5
Pantothenic acid b5 (mg)		2		
Biotin b7 (mcg)		50		
Folic acid b9 (mcg)		100		
Vitamin B12 (mcg)		2		
Vitamin C (mg)		25	80	50
Vitamin A (IU)	2300	1250	2666	5000
Vitamin D2 (IU)	400	200	800	400
Vitamin E (mg)	6.4	5		
Vitamin K (mcg)	200	25		
Zinc (mg)		5		
Selenium (mcg)		25		
Iron (mg)		5		
Copper (mg)		1		
Manganese (mg)		0.35		
Phosphorus (mg)		0		
Iodine (mcg)		75		
Chromium (mcg)		50		
Molybdenum (mcg)		50		
Calcium (mg)		0		
Potassium (mg)		300		
Magnesium (mg)		56.25		
Sodium (mg)		108		
Flouride (mg)		0		

Table 4 Paediatric intravenous (iv) and oral preparations

BAPEN brings together the strengths of its Core Groups to optimise nutritional care

