

1. Introduction and Scope

- 1.1 This guideline applies to all healthcare professionals who are involved with paediatric inpatients (those above 0 years and under 18 years of age) who may be at risk of refeeding syndrome when receiving oral and enteral nutritional support. It aims to provide guidance on how to identify and manage those who may be at risk of re-feeding syndrome when receiving nutritional support interventions. For patients aged 18 years and over please refer to 'Clinical Guideline for the Nutrition and Dietetic Assessment and Management of Adult Inpatients' risk of Refeeding syndrome' Trust Ref: C55/2015 which can be found on UHL Trust INsite.
- 1.2 Refeeding syndrome is a potentially severe complication that can occur once feeding is initiated in patients after a period of starvation. Nationally, there is currently no consensus agreement for the prevention and management of paediatric inpatients at risk of re-feeding syndrome (Faiman and Fisher, 2011). Therefore, this guideline is based on the principles outlined in national adult guidance (National Institute for Health and Care Excellence, 2006) (Royal College of Psychiatrists London, 2012).
- 1.3 Patients most at risk of developing refeeding syndrome include those who have anorexia nervosa; patients undergoing chemotherapy; post-operative patients; and patients with chronic malabsorption. N.B. This is not an extensive list. Please refer to Appendix 1 for the criteria to identify patients at risk of refeeding syndrome.
- 1.4 It is the responsibility of the medical team (and the Dietitians if already involved in the care of an inpatient) to identify patients who are at risk of refeeding syndrome.
- 1.5 Those who are identified as being at risk must be referred to a Dietitian immediately via ICE.
- 1.6 For patients on the Children's Intensive Care Unit (CICU) or Paediatric Intensive Care Unit (PICU) this guideline should be used in conjunction with 'Feeding Guidelines for Children on Intensive Care Units' Trust Ref: C90/2016 which can be found on UHL Trust INsite; where feed initiation rates may be slower than those recommended in this guideline.

The initiation rates in the CICU Guideline should be adhered to if they are slower than those used in this guideline. However, the biochemical monitoring recommended in this guideline should be used.

2. Recommendations, Standards and Procedural Statements

Flow Chart 1: Summary of the Management of Paediatric Inpatients at Risk of Refeeding Syndrome

Medical team to identify inpatient at risk of refeeding syndrome. **See Appendix 1.**

Document this clearly in the medical notes and send an urgent referral to the Dietitian via ICE **and** phone/bleep the ward Dietitian.



Medical team to take bloods to check the following: Sodium (Na), Potassium (K), Calcium (Ca), Magnesium (Mg), Phosphate (PO₄), and glucose.

Correct any electrolyte abnormalities, using Trust guidelines: Fluid and Electrolyte management C6/2015; Hypoglycaemia in Infants and Children (not for use in the NNU or for Children diagnosed with diabetes) C19/2017; Treatment of Hypocalcaemia C92/2016. For treatment of hypomagnesaemia and hypophosphataemia see IV monogram for magnesium sulphate and for potassium acid phosphate. Contact a Paediatric Pharmacists if advice is required by bleeping the ward pharmacist or calling the on call pharmacist via switchboard.



Medical team to prescribe Thiamine and B-vitamins as per **Appendix 2**



The Dietitian is to use **Appendix 3** to commence and increase enteral tube feeds.

If out of hours i.e outside of 9am-4.30pm on Monday-Friday or a weekend, please refer to **Appendix 4** for those under the age of 1 year or **Appendix 5** for those between the ages of 1 – 18 years.

If feeding via parenteral nutrition (PN) please refer to the PN guidelines (Guideline for the Use of Parenteral Nutrition (PN) in term neonates, children and adolescents (excludes patients on the Neonatal Unit (NNU) (C43/2018)). Contact a Paediatric Pharmacist as soon as possible by bleeping your ward pharmacist.

If the patient is under Child and Adolescent Mental Health Service (CAMHS) for an eating disorder, send an urgent referral to the Dietitian via ICE **and** phone/bleep the ward Dietitian. Please call the CAMHS team to make them aware of the admission.



If **feeding orally without oral nutritional supplements e.g Fortisip/ Fortini** the Dietitian will consider initiating a multivitamin and/ or mineral supplement if diet is not nutritionally adequate.

If **feeding orally with oral nutritional supplement support or via an enteral feeding tube** then an additional multivitamin and/ or mineral does not need to be routinely prescribed. It is the Dietitian's role to check that the intake is nutritionally adequate for the patient.



Monitoring whilst at risk of refeeding syndrome:

Doctors to check blood electrolytes (**Na, K, Mg, PO₄ and Ca**) every 12-24 hours initially, followed by daily until full energy requirements are reached; monitoring after this will be guided by the lead consultant. Specialist gastroenterology opinion could be considered as necessary. Some patients may need monitoring up to 2 weeks. These should be documented in the medical notes.



If **electrolytes drop below normal range** do not increase feeds until electrolytes are corrected as per hospital guidelines stated above. Only increase feeds as per dietetic advice. Dietitians refer to **Appendix 3** for guidance.



If **electrolytes drop but stay within range** correct electrolytes are corrected as per hospital guidelines stated above Increase feeds as per dietetic advice. Dietitians refer to **Appendix 3** for guidance.



If **electrolytes do not change** continue to monitor once a day and increase feeds as per dietetic advice. Dietitians refer to **Appendix 3** for guidance.

3. **Education and Training**

Ward Dietitians to make the nurses, doctors and consultants aware of this guideline by:

- *Emailing the Ward Matrons and Sisters to disseminate to Ward Nurses*
- *Presenting to Consultants/Doctors*
- *Discussing on the ward, with relevant members of ward staff, where appropriate*

4. **Monitoring and Audit Criteria**

Key Performance Indicator	Method of Assessment	Frequency	Lead
Datix incidents – Paediatric Dietitians to datix if children identified at being at risk of refeeding syndrome do not have their serum Na, K, Mg, PO4 , Ca checked initially or continued daily until full feeds are met and the above electrolytes are within range	Number of datix incidents related to refeeding syndrome/management of refeeding syndrome in paediatric patients. To be obtained via Patient Safety Team.	Quarterly	Senior Dietitian (Paediatrics)

5. **Supporting Documents and Key References**

Faiman, A, Fisher, R (2011) Conference: European Society for Paediatric Gastroenterology, Hepatology and Nutrition Annual meeting 2011. Journal of Paediatric Gastroenterology and Nutrition.

(Scientific Advisory Committee on Nutrition. Dietary Reference Values for Energy. TSO, London 2011)

National Institute for Health and Care Excellence (NICE). (2006) Nutrition Support in Adults. NICE Guideline (CG32).

Royal College of Psychiatrists London (2012) Junior MARSIPAN : Management of Really sick Patients under 18 with Anorexia Nervosa

Hayes, K, C., Hegstead, D,M., (1973) Toxicity of the Vitamins in: National Research Council (US). Food Protection Committee Toxicants Occurring Naturally in Foods. 2nd Edition. Washington DCL: National Academy Press

6. **Key Words**

Refeeding, Paediatrics

DEVELOPMENT AND APPROVAL RECORD FOR THIS DOCUMENT

Author / Lead Officer:	Andrew Furlong	Job Title: Medical Director
Reviewed by:	Ellen Wilford (Senior Specialist Dietitian)	
Approved by:	Policy and Guideline Committee	Date Approved: 19.8.22 v3)

REVIEW RECORD

Date	Issue Number	Reviewed By	Description Of Changes (If Any)
19/07/22	3	Ellen Wilford	Nil

DISTRIBUTION RECORD:

Date	Name	Dept	Received

Children who are at risk of refeeding syndrome include those with one or more of the following symptoms below
Children who have had little (less than 50% of usual intake) or no nutrition for 5 days or more
Children who have experienced acute weight loss of 15% or more in the last 6 months
Children who have abnormal blood levels of potassium, magnesium or phosphate prior to feeding

Children who are at risk of refeeding syndrome can be identified with two or more of the following symptoms below
Children who have experienced acute weight loss of 5-10% in the past 2 months
Children with a previous history of refeeding syndrome
Children who are severely underweight. Plot patient's current and historical weights, height/length/head circumference and body mass index (BMI) on a growth chart to identify this. If the child's BMI sits below the 0.4 th centile then they are classed as being severely underweight.
Children who have experienced malabsorption, severe vomiting and/or diarrhoea for 5 days or more

There is currently no published data on use and dosing of vitamin supplementation for the prevention of refeeding syndrome. The following data has been found after an extensive literature search and provides initial dosing of vitamin supplementation. Please contact a Paediatric Pharmacist for advice by bleeping the ward Paediatric Pharmacist.

Day 0 – Day of first planned feeding – IV supplementation (IV Pabrinex Infusion) (Licensed for age but off label for indication)	
Age (years)	Medication
6 and under	2.5ml of Pabrinex 1 and 2.5ml of Pabrinex 2
7 – 9	3.5ml of Pabrinex 1 and 3.5ml of Pabrinex 2
10 – 11	5ml of Pabrinex 1 and 5ml of Pabrinex 2
12 – 14	6ml of Pabrinex 1 and 6ml of Pabrinex 2
15 and over	10ml of Pabrinex 1 and 10ml of Pabrinex 2
Days 1-10 – Oral Supplementation (0.5mg/kg/day thiamine, 5mg limited absorption)	
1 month - 1 years	Vigranon Liquid 5ml TDS
2 - 11 years	Vigranon Liquid 10ml TDS
12 years and over	Vigranon Liquid 15ml TDS Or Thiamine 100mg TDS And Vitamin B Co Strong 1-2 tabs TDS

Phase	Action
<p>Initiating oral intake or enteral tube feeds.</p>	<p>Initiate feeds/ oral intake at 50% of Estimated Average Requirements (EAR) (SACN) - please see Appendix 6. Use clinical judgement, if a patient was previously thriving on less than their EAR, then feed to 50% of their usual energy intake. Consider the appropriate route of feeding and discuss with the patient's consultant. If oral intake is possible (patient safety and patient compliance dependent) then advise on suitable foods for calorie intake, and consider the use of an oral nutritional supplement if required. Note that the use of fast acting glucose sources such as fruit juices and sugary drinks is not advisable as the first foods to introduce.</p> <p>If the patient has been regularly having more than 50% of their EAR (SACN) then do not decrease their current energy intake.</p> <p>Ensure that the macro nutrient intake is balanced and appropriate for the patient.</p>
<p>Increasing feeds.</p>	<p>Increase feeds every day by 10-20% of their current daily calorie intake, until the patient's estimated energy requirements are met.</p> <p>Do not increase energy intake until electrolyte abnormalities have been corrected (Na, K, Mg, PO₄ and Ca).</p> <p>Ensure that the patient's intake is nutritionally adequate. Consider a multivitamin and mineral supplement if oral intake or enteral tube feed is not providing adequate micronutrients.</p>
<p>Biochemistry</p>	<p>See Flow chart 1 on page 2 for advice on monitoring: which biochemical markers to monitor and the frequency and duration to monitor them for. Alert the doctors on the ward regarding any abnormalities.</p> <p>Consider checking nutritional bloods such as ferritin, fat soluble vitamins and trace elements if the patient has had a long period of inadequate nutritional intake and is therefore is at risk of micronutrient deficiencies.</p>

Appendix 4 – Total daily feed volume to commence enterally fed children under 1 year identified as being at risk of refeeding syndrome

- Always consult with the lead Consultant regarding the route and frequency of feeding and any additional fluid which may be required.
- Only use this as guidance to commence feeds when it is out of hours. Always refer the patient to the Dietitian.
- Do not increase feeds until guided by the Dietitian
- If the child is known to have an allergy, use their alternative infant formula at a standard concentration (as per basic instructions found on the formula tin).

* High calorie infant formulas: Infatrini, Infatrini Peptisorb, SMA Pro High energy, and Similac High Energy.

Age of patient	Expressed breast milk	Breast milk substitute (Standard infant formula)	High calorie infant formula *	Mixed feeding – breast milk and standard infant formula
0-2 months	Commence feeds at 72mls/kg/day.	Commence feeds at 90mls/kg/day	Commence feeds at 60mls/kg/day	Commence feeds at 90mls/kg/day
3-4 months	Commence feeds at 72mls/kg/day.	Commence feeds at 72mls/kg/day.	Commence feeds at 48mls/kg/day	Commence feeds at 72mls/kg/day.
5-6 months	Commence feeds at 54mls/kg/day.	Commence feeds at 72mls/kg/day.	Commence feeds at 48mls/kg/day	Commence feeds at 54mls/kg/day.
7-12 months	Commence feeds at 54mls/kg/day.	Commence feeds at 54mls/kg/day.	Commence feeds at 36mls/kg/day	Commence feeds at 54mls/kg/day.

Appendix 5 – Total daily feed volume to commence enterally fed children between the age of 1-18 years identified as being at risk of refeeding syndrome.

- Always consult with the lead Consultant regarding the route and frequency of feeding and any additional fluid which may be required.
- Only use this as guidance to commence feeds when it is out of hours. Always refer the patient to the Dietitian.
- Do not increase feeds until guided by the Dietitian
- If the child is known to have an allergy please speak with the lead Consultant regarding an alternative feed.
- If the child is already fed via an enteral feeding tube, please use their usual feeding plan, and commence feeds at 50% of their usual feeding volume.

Age of patient (years)	If weight is between 8-20kg		If weight greater than 20kg	
	Male Commence feeds at:	Female Commence feeds at:	Male Commence feeds at:	Female Commence feeds at:
1	40mls/kg/day of Nutrini	40mls/kg/day of Nutrini		
2	41mls/kg/day of Nutrini	41mls/kg/day of Nutrini		
3	41mls/kg/day of Nutrini	39mls/kg/day of Nutrini		
4	43mls/kg/day of Nutrini	41mls/kg/day of Nutrini		
5	40mls/kg/day of Nutrini	38mls/kg/day of Nutrini		
6	37mls/kg/day of Nutrini	35mls/kg/day of Nutrini	37mls/kg/day of Nutrison	35mls/kg/day of Nutrison
7	36mls/kg/day of Nutrini	34mls/kg/day of Nutrini	36mls/kg/day of Nutrison	34mls/kg/day of Nutrison
8	34mls/kg/day of Nutrini.	32mls/kg/day of Nutrini	34mls/kg/day of Nutrison.	32mls/kg/day of Nutrison
9	32mls/kg/day of Nutrini	30mls/kg/day of Nutrini	32mls/kg/day of Nutrison	30mls/kg/day of Nutrison
10	32mls/kg/day of Nutrini	31mls/kg/day of Nutrini	32mls/kg/day of Nutrison	31mls/kg/day of Nutrison

Age of patient (years)	If weight is between 8-20kg		If weight greater than 20kg	
	Male Commence feeds at:	Female Commence feeds at:	Male Commence feeds at:	Female Commence feeds at:
11	31mls/kg/day of Nutrini	28mls/kg/day of Nutrini	31mls/kg/day of Nutrison	28mls/kg/day of Nutrison
12	30mls/kg/day of Nutrini	27mls/kg/day of Nutrini	30mls/kg/day of Nutrison	27mls/kg/day of Nutrison
13	28mls/kg/day of Nutrini	24mls/kg/day of Nutrini	28mls/kg/day of Nutrison	24mls/kg/day of Nutrison
14	27mls/kg/day of Nutrini	23mls/kg/day of Nutrini	27mls/kg/day of Nutrison	23mls/kg/day of Nutrison
15	26mls/kg/day of Nutrini	23mls/kg/day of Nutrini	26mls/kg/day of Nutrison	23mls/kg/day of Nutrison
16	25mls/kg/day of Nutrini	22mls/kg/day of Nutrini	25mls/kg/day of Nutrison	22mls/kg/day of Nutrison
17	Commence feeds at 24mls/kg/day of Nutrini	Commence feeds at 22mls/kg/day of Nutrini	Commence feeds at 24mls/kg/day of Nutrison	Commence feeds at 22mls/kg/day of Nutrison
18	Commence feeds at 24mls/kg/day of Nutrini	Commence feeds at 22mls/kg/day of Nutrini	Commence feeds at 24mls/kg/day of Nutrison	Commence feeds at 22mls/kg/day of Nutrison

Age Months	EAR		
	Breast Fed	Breast milk substitute fed	Mixed feeding or unknown
	kcal		
	Per kg/day	Per kg/day	Per kg/day
Boys			
1-2	96	120	120
3-4	96	96	96
5-6	72	96	72
7-12	72	72	72
Girls			
1-2	96	120	120
3-4	96	96	96
5-6	72	96	72
7-12	72	72	72

Age (years)	EAR	
	Boys kcal/kg/day	Girls kcal/kg/day
1	80	80
2	82	81
3	82	78
4	85	81
5	80	75
6	74	70
7	71	67
8	67	63
9	63	59
10	64	61
11	62	56
12	59	53
13	56	48
14	54	46
15	51	45
16	49	44
17	48	43
18	48	43