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<b>Target Audience:</b>	NHS Lothian paediatric medical, trained nursing and dietetic staff within the Royal Hospital for Children and Young People		
<b>Supersedes:</b>	Version 1		
<b>Keywords (min. 5):</b>	Refeeding Syndrome, PYMS, Nutrition, Enteral Nutrition, Parenteral Nutrition, Malnutrition		

## Version Control

Date	Author	Version/Page	Reason for change
		V1.0	Established need for guideline to manage, potentially, fatal complication of nutritional intervention
12/07/23	Paediatric Advanced Dietetic Practitioner	V1.1	Correction of terminology Clarification of starting rates of enteral nutrition

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## 1.0 Purpose

Refeeding is the process of reintroducing nutrition after a period of decreased or absent intake <sup>4, 7</sup>. Refeeding syndrome is a serious and potentially fatal complication that can occur during introduction of nutrition orally, enterally, or parenterally <sup>1, 4, 5, 10, 12</sup>.

It is caused by sudden shifts in electrolytes, that occur naturally in the body, that help metabolise food. The incidence of refeeding syndrome is difficult to determine as there isn't a standard definition and symptoms are not specific. Manifestations can affect most body systems, shown in Appendix 1, and can lead to clinical deterioration and possible death <sup>4, 5, 8, 10</sup>.

During periods of decreased or absent intake reductions in cellular activity and organ function occur in combination with micronutrient, mineral, and electrolyte deficiencies. The major sources of energy in these patients are fat and muscle; total body stores of nitrogen, phosphate, magnesium, and potassium are depleted. Sudden reversal by introducing nutrition, especially carbohydrate, leads to a surge of insulin secretion, intracellular shifts of phosphate, magnesium and potassium resulting in low serum levels <sup>2, 7</sup>, disruptions of fluid balance with oedema <sup>9</sup>, hypoalbuminemia and thiamine deficiency <sup>1, 7</sup>.

## 2.0 Scope

In paediatric hospitals, in developed countries, between 2% and 34% of patients suffer from malnutrition <sup>3, 6, 9</sup> associated with longer admissions and poorer survival rates <sup>11</sup>. The potential for refeeding syndrome should be considered whenever nutritional support is instituted; the more malnourished the patient the higher the risk <sup>2</sup>.

The aim of this guideline is:

- Allow identification of patients at risk
- Support all staff to appropriately classify patients with either medium or high risk
- To provide management guidelines for patients deemed at risk
- To raise awareness of refeeding syndrome and associated clinical manifestations

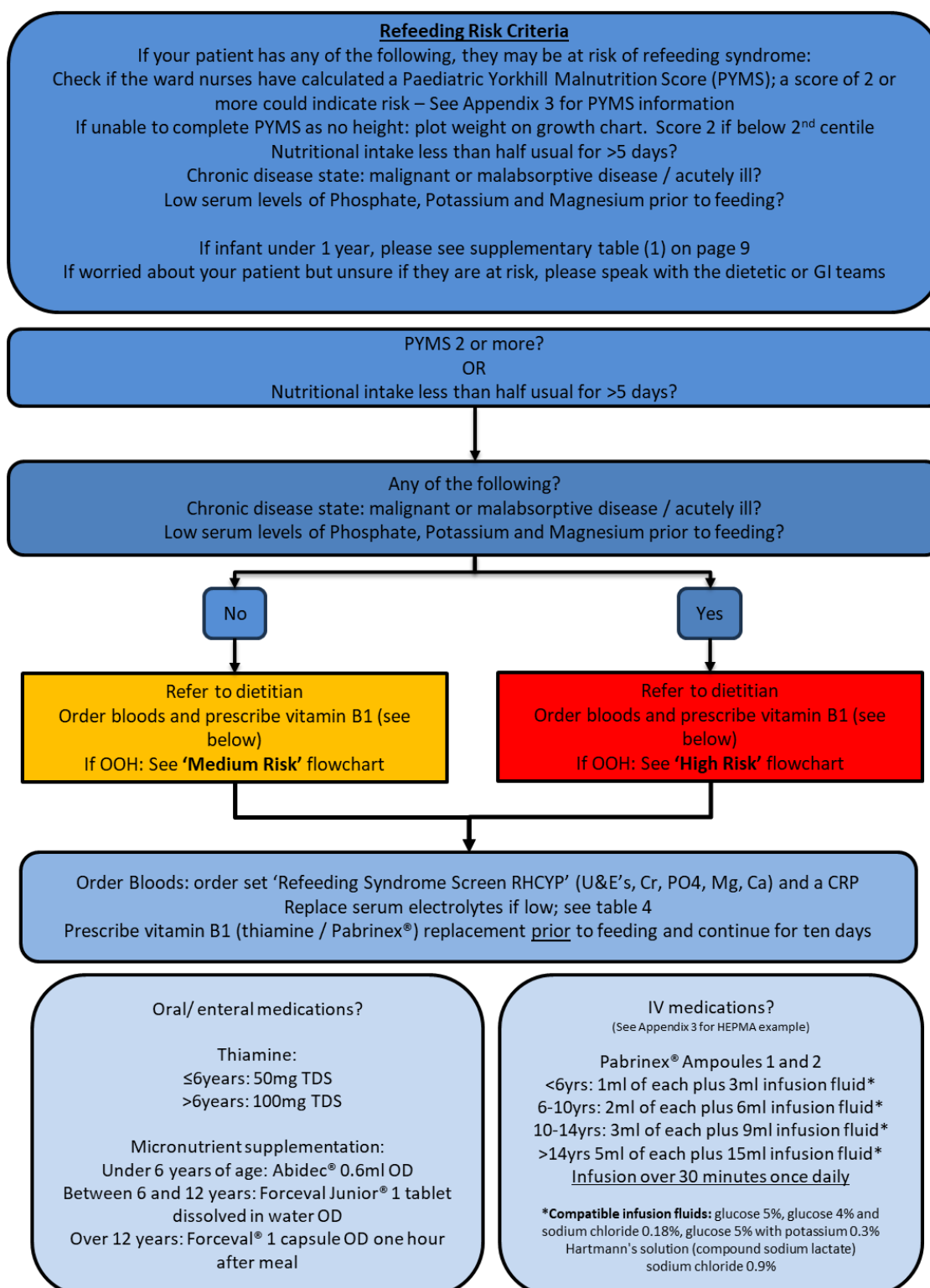
## 3.0 Definitions

- **Ca** – Calcium
- **Cr** – Creatinine
- **CRP** – C-reactive protein
- **EBM** – expressed breast milk
- **IV** – intravenous
- **MF** – multifibre
- **Mg** – Magnesium
- **OD** – Omni diet (every day)
- **OOH** – Out of hours
- **PEWS** – Paediatric Early Warning Score
- **PO4** – Phosphate
- **PN** – Parenteral Nutrition
- **PYMS** – Paediatric Yorkhill Malnutrition Score
- **RHCYP** – Royal Hospital for Children and Young People
- **TDS** – ter die sumendum (to be taken three times daily)
- **U&Es** – Urea and electrolytes

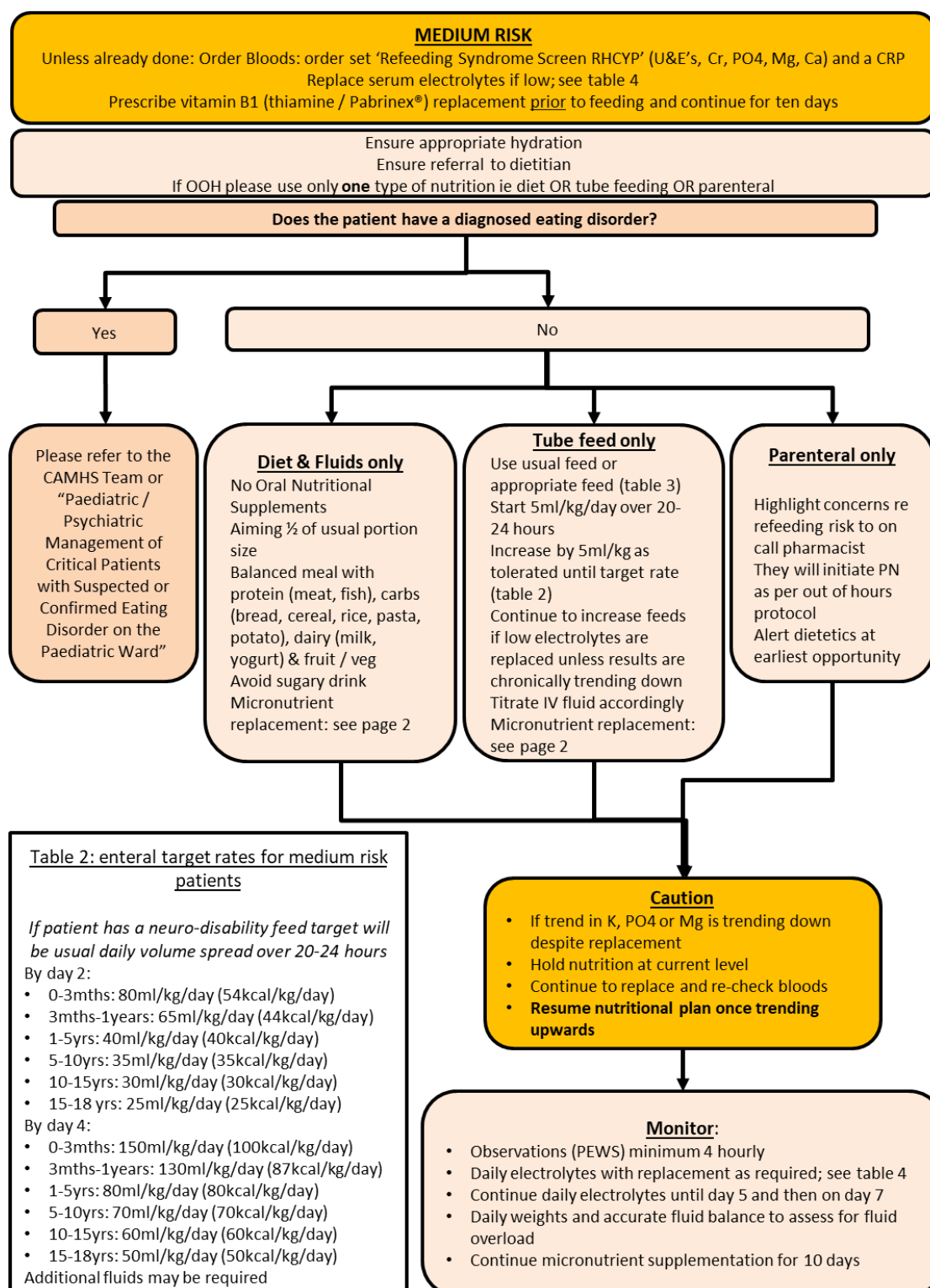
## 4.0 Roles and responsibilities

It is the responsibility of all staff, involved in the care of an infant, child, or young person, admitted to NHS Lothian Paediatric Services to be aware of this guideline.

## 5.0 Main content

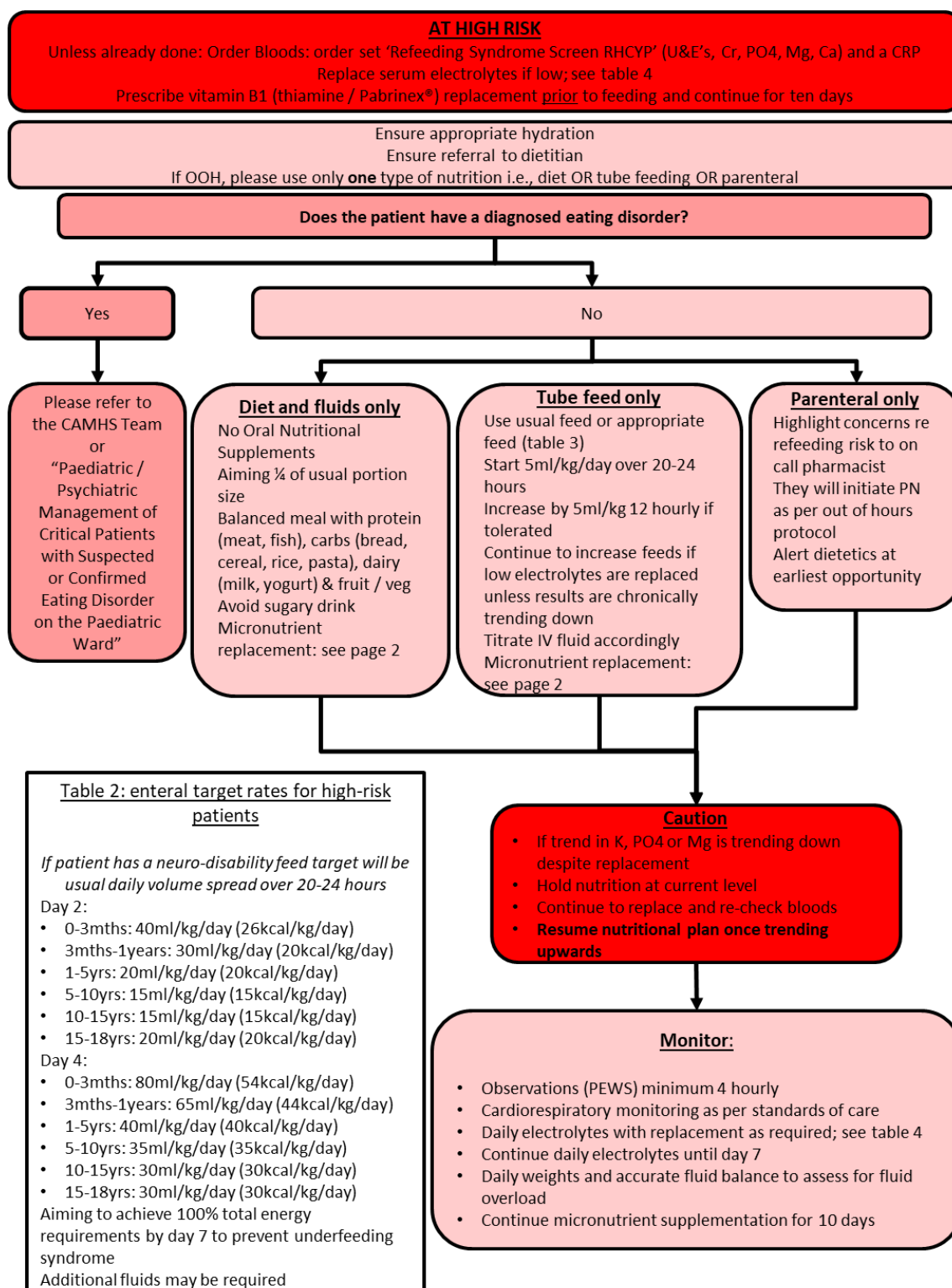


# Guideline for the management of infants, children, and adolescents at risk of refeeding syndrome at RHCYP





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**Supplementary tables**

Table 1 criteria for infants under 1 year of age

Growth concerns in infants under 1 year can be classified as:

- A fall across 1 or more weight centile spaces, if birthweight was below the 9th centile
- A fall across 2 or more weight centile spaces, if birthweight was between the 9th and 91st centiles
- A fall across 3 or more weight centile spaces, if birthweight was above the 91st centile
- BMI below the 2<sup>nd</sup> centile
- Height and weight greater than 2 centile spaces apart

Table 3: feed choice

*Aim to use the formula / feed patient is usually on*

- Premature baby: EBM or usual formula
- Infant: EBM or usual formula
- Child 9-20kg: Nutrini MF or usual feed (1kcal/ml)
- Child: 21kg+: Nutrison MF or usual feed (1kcal/ml)

Exceptions

- Allergy:
  - Infant: Neocate LCP (0.67kcal/ml)
  - Child 9-20kg: Neocate Junior (1kcal/ml)
  - Child >21kg+: Elemental 028 Extra (0.86kcal/ml)
- Metabolic / Ketogenic
  - Contact respective Team
- GI Surgery
  - Infant: Infatrini Peptisorb (1kcal/ml)
  - Child 9-21kg: Peptamen Junior (1kcal/ml)
  - Child >21kg+: Peptamen (1kcal/ml)

Table 4 electrolyte supplementation

- Concern if electrolytes below lower reference range for age on Trak
- Speak with pharmacy
  - Supplement as per BNF-C
  - IV administration as per Medusa monographs

## 6.0 Associated materials

For patients with diagnosed eating disorders please contact the CAMHS Team for appropriate management. A specific guideline for this patient group, 'Paediatric / Psychiatric Management of Critical Patients with Suspected or Confirmed Eating Disorder on the Paediatric Ward' is currently under review. This will incorporate the Medical Emergencies in eating disorders (MEED) Guidance on recognition and management <sup>13</sup>.

## 7.0 Evidence base

1. Agarwal, J. *et al* (2012) 'Refeeding syndrome in children in developing countries who have celiac disease', *JPGN*, 54 (4), pp. 521-524.
2. Braegger, B. *et al*. (2010) 'Practical Approach to Paediatric Enteral Nutrition: A Comment by the ESPGHAN Committee on Nutrition', *JPGN*, 54(1), pp. 110-122
3. Crook, M. (2014) 'Refeeding syndrome: problems with definition and management' *Nutrition*, 30, pp. 1448-1455.
4. da Silva, J. S. V. *et al*. (2020) 'ASPEN Consensus Recommendations for Refeeding Syndrome', *Nutrition in Clinical Practice*, 35(2), pp. 178–195. doi: 10.1002/ncp.10474.
5. De Silva, A. and Nightingale, J. M. D. (2019) 'Refeeding syndrome: Physiological background and practical management', *Frontline Gastroenterology*. BMJ Publishing Group, pp. 404–409. doi: 10.1136/flgastro-2018-101065.
6. Friedli, N. *et al*. (2018) 'Management and prevention of refeeding syndrome in medical inpatients: An evidence-based and consensus-supported algorithm', *Nutrition*, 47, pp. 13–20. doi: 10.1016/j.nut.2017.09.007.
7. Friedli, N. *et al* (2017) 'Revisiting the refeeding syndrome: results of a systematic review', *Nutrition*, 35, pp. 151-160.
8. Guy's and St Thomas', King's College and University Lewisham Hospitals (2012) 'Paediatric Formulary', 9<sup>th</sup> Edition
9. Joint Formulary Committee. British National Formulary (online) London: BMJ and Pharmaceutical Press <<http://www.medicinescomplete.com>> [Accessed on [29 August 2023]]

10. Khan, L. U. R. *et al.* (2010) 'Refeeding Syndrome: A Literature Review', *Gastroenterology Research and Practice*, 2011, pp. 1-6.
11. Matthews-Rensch, K., Capra, S. and Palmer, M. (2020) 'Systematic Review of Energy Initiation Rates and Refeeding Syndrome Outcomes', *Nutrition in Clinical Practice*. John Wiley and Sons Inc. doi: 10.1002/ncp.10549.
12. Reber, E. *et al.* (2019) 'Management of Refeeding Syndrome in Medical Inpatients', *Journal of Clinical Medicine*, 8(12), p. 2202. doi: 10.3390/jcm8122202.
13. Rytter, M. J. H. *et al* (2017) 'Risk factors for death in children during inpatient treatment of severe acute malnutrition', *Am J Clin Nutr*, 105, pp. 494-502.
14. Shimizu, K. *et al* (2014) 'Refractory hypoglycaemia and subsequent cardiogenic shock in starvation and refeeding: report of three cases', *Nutrition*, 30, pp. 1090-1092.
15. Royal College of Psychiatrists (2022) 'Medical emergencies in eating disorders (MEED): Guidance on recognition and management', CR233.

## 8.0 Stakeholder consultation

Approved through consultation with NHS Lothian Dietetic Department and NHS Lothian Paediatric Gastroenterology Hepatology and Nutrition Group.

## 9.0 Monitoring and review

For review in three years through the services as above.

## 10.0 Appendix

## Appendix 1: Clinical Manifestation of Refeeding Syndrome

	Phosphate	Potassium	Magnesium
Cardiovascular	Heart Failure Arrhythmia Hypotension Cardiomyopathic shock Death	Hypotension Ventricular arrhythmia Cardiac Arrest Bradycardia Tachycardia	Paroxysmal atrial or ventricular arrhythmia  Repolarisation alternans
Respiratory	Hypoventilation Respiratory Failure	Hypoventilation Respiratory distress Respiratory Failure	Hypoventilation Respiratory distress Respiratory failure
Gastrointestinal	Hepatic dysfunction LFT abnormalities	Diarrhoea Nausea Vomiting Anorexia Paralytic Ileus Constipation	Abdominal pain Diarrhoea Vomiting Anorexia Constipation
Renal	Acute tubular necrosis Metabolic Acidosis		
Skeleton	Rhabdomyolysis Weakness Myalgia Diaphragm weakness Impaired musculoskeletal function	Weakness Fatigue Muscle twitching	Weakness Fatigue Muscle cramps Ataxia
Neurology	Delirium Coma Seizures Tetany Paraesthesia		Hallucinations Depression Convulsions
Endocrine	Hyperglycaemia Insulin resistance Osteomalacia		

## Appendix 2: PYMS

The PYMS score is now recorded on Trak; in the questionnaire section of the EPR Menu

Questionnaires - This episode <span>➕ New</span>		
Questionnaire	Date	Time
<a href="#">Mobility assessment</a>	09/05/2024	18:36
<a href="#">Peripheral vascular catheter</a>	09/05/2024	18:34
<a href="#">Paediatric Yorkhill malnutrition score</a>	09/05/2024	07:37

**Body Mass Index (BMI) Scoring Guide**  
If the BMI Calculated is less than that shown for age and gender, answer Yes for Step 1

Age (Years)	1	2	3	4	5	6	7	8	9
Boys	15.0	14.5	14.0	13.5	13.5	13.5	13.5	13.5	13.5
Girls	15.0	14.0	13.5	13.5	13.0	13.0	13.0	13.0	13.0

Age (Years)	10	11	12	13	14	15	16	17	18
Boys	14.0	14.0	14.5	15.0	15.5	16.0	16.5	17.0	17.0
Girls	13.5	14.0	14.5	15.0	15.5	16.0	16.5	17.0	17.0

Date: 09/05/2024

**STEP 1**  
Is the BMI below the cut off value in the table above? ☒ No ☐ Yes

**STEP 2**  
Has the child lost weight recently? ☒ No ☐ Yes - unintentional weight loss / clothes looser / poor weight gain (if <2yrs)

**STEP 3**  
Has the child had a reduced intake (including feeds) for at least the past week? ☒ No ☐ Yes - decrease of usual intake ☐ Yes - no intake (or a few sips of feed only)

**STEP 4**  
Will the child's nutrition be affected by the recent admission / condition for at least the next week? ☒ No ☐ Yes - decreased intake / increased requirements / increased losses ☐ Yes - no intake (or a few sips of feeds only)

Last recorded score:

**TOTAL SCORE** 0

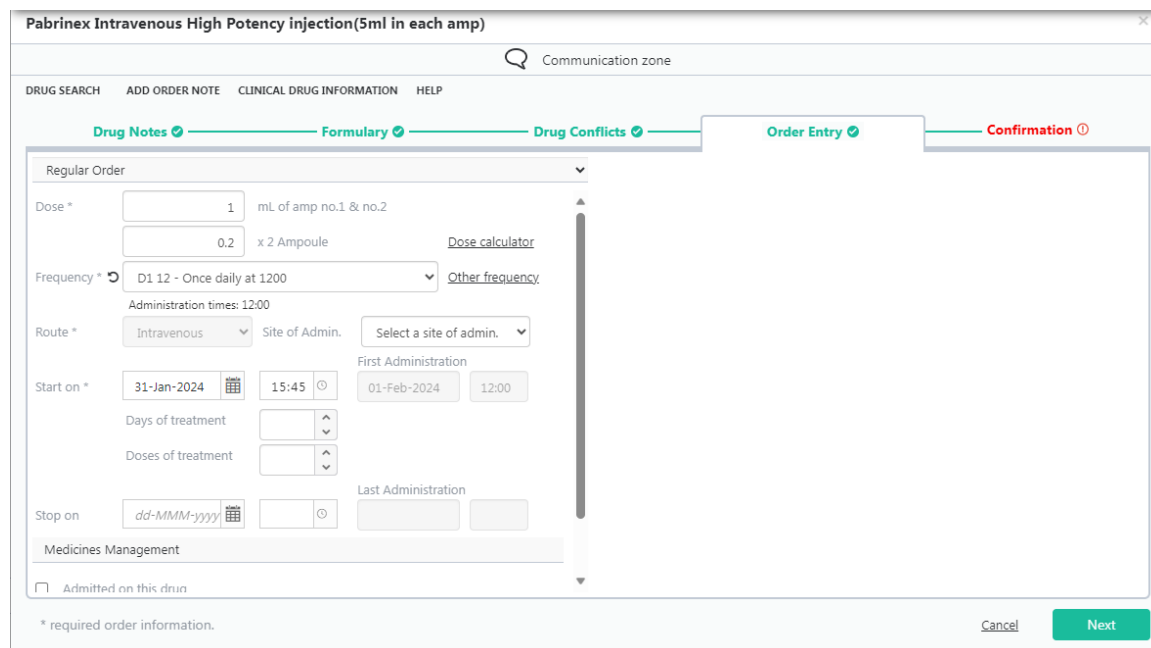
Review date: 16/05/2024

**PYMS Dietetic Management Pathway**  
Action:

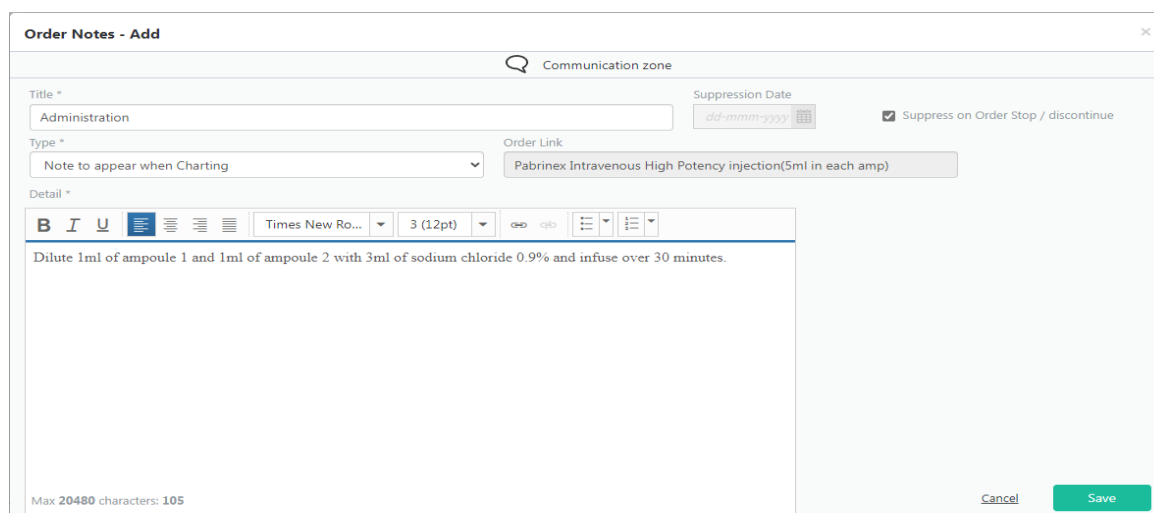
\*\*\*\*NB: Regardless of PYMS score if you have any nutritional concerns about this patient please refer to dietitian following initial screening\*\*\*\*

## Appendix 3: Pabrinex® Prescribing on HEPMA

1. Search for Pabrinex Intravenous High Potency Injection and add dose and frequency as per guidance in Section 5.



2. Add an order note with chosen infusion fluid and infusion time as per Section 5.



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3. Check prescription is correct and order note appears before prescribing.

Legend

The following orders will be added

REGULAR

NON STOCK

Pabrinex Intravenous High Potency injection(5ml in each amp)

Dose1 mL of amp no.1 & no.2

RouteIntravenous

FrequencyD1 12 - Once daily at 1200

Rx on31-Jan-2024 15:44

Stop on

BNF Vitamin B group

PrescriberMELISSA DAVIDSON

DateJ...February 2024

Day31

1234567891011121314151617181920212223242526

12:00

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