REFEEDING SYNDROME: PREVENTION AND MANAGEMENT - SCH

PRACTICE GUIDELINE ©

DOCUMENT SUMMARY/KEY POINTS

This document is to be used in conjunction with:

Sydney Children's Hospital Guidelines for the Administration of Intravenous Drugs to Paediatric Patients – available in the medication room of each ward.

Refeeding Syndrome

- Adverse body response that occurs with the initiation of nutrition after a period of poor intake or starvation, especially in the already malnourished patient.
- Involves derangement of serum electrolytes (specifically changes in phosphate, potassium, and magnesium), vitamin deficiencies, and sodium and fluid retention.
- Can be life threatening and can lead to cardiac, neurological and haematological complications in particular cardiac failure, arrhythmia, delirium, seizures and anaemia.
- Education purposes so that the reader can have a very brief overview of the document.
- Refer to the 'Summary of Recommendations' (Section 2) and the 'Management' flowchart (Section 3) for details.

Approved by:	Director Clinical Governance	
Date Effective:	1st July 2013	**Review Period:** 3 years
Team Leader:	Clinical Nurse Consultant	**Area/Dept:** Mental Health Unit

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CHANGE SUMMARY

- This document replaces SCH.C.19.R.1 Prevention and Management of Refeeding Clinical Guideline.
- Due for mandatory review - Procedures contain no change in practice.

READ ACKNOWLEDGEMENT

- SCH nurses, and other clinical staff, with direct responsibilities for patients undergoing refeeding, must read and acknowledge that they have a clear understanding of this guideline.
- Discretionary: For all other staff, the local manager to determine which staff, if any, are to read and acknowledge the document.
- Line managers are to maintain records of staff read acknowledgements for quality review and compliance audit processes.

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1 Refeeding Syndrome

1.1 What is refeeding Syndrome?

- Adverse body response that occurs with the initiation of nutrition after a period of poor intake or starvation, especially in the already malnourished patient.
- Involves derangement of serum electrolytes (specifically changes in phosphate, potassium, and magnesium), vitamin deficiencies, and sodium and fluid retention.
- Can be life threatening and can lead to cardiac, neurological and haematological complications in particular cardiac failure, arrhythmia, delirium, seizures and anaemia.

1.2 What are the Signs and Symptoms of Refeeding Syndrome?

Main components can be thought of as complications due to hypophosphataemia, hypokalaemia and hypomagnaesaemia (see Table 1) as well as:

- Abnormalities of fluid balance (e.g. peripheral oedema, pulmonary oedema, congestive cardiac failure).
- Vitamin deficiency (e.g. thiamine deficiency – symptoms can include peripheral neuropathy, vomiting, ataxia and ocular cranial nerve palsies, tachycardia and fluid overload).
- Abnormalities of glucose metabolism (hypo or hyper-glycaemia).

To be used in conjunction with:

- Paediatric Injectable Drugs Guidelines SCH Edition, – available in the medication room of each ward and on the SCH Pharmacy Department Page.

Table 1: Complications of hypophosphataemia, hypokalaemia and hypomagnesaemia

Effects	Low Phosphate	Low Potassium	Low Magnesium
Cardiovascular	Congestive heart failure, sudden death, arrhythmias, cardiomyopathy, decreased cardiac contractility, hypotension	hypotension, ventricular arrhythmias, cardiac arrest, bradycardia or tachycardia, premature atrial or ventricular beats	paroxysmal atrial and ventricular dysrhythmias, repolarisation alternans
Neurological	Acute areflexic paralysis, ataxia, coma, confusion, cranial nerve palsies, diffuse sensory loss, Guillain-Barré-like syndrome, lethargy, paraesthesias, seizures, weakness, acute respiratory failure, rhabdomyolysis.	Lethargy, delirium or other mental status changes, decreased muscle strength, decreased tendon reflexes, tetany, fasciculations, rhabdomyolysis	hyperactive deep tendon reflexes, muscle cramps, muscle fibrillation, Trousseau and Chvostek signs, weakness, ataxia, seizures, vertigo, paraesthesia
Respiratory	Respiratory failure, ventilator dependency	Hypoventilation, respiratory distress, respiratory failure	
Haematological	Altered red blood cell function,haemolytic anaemia, haemorrhage, thrombocytopenia, white blood cell dysfunction		Anaemia

Gastrointestinal	paralytic ileus, constipation		abdominal pain, diarrhoea, constipation, anorexia,
Metabolic			hypokalaemia, hypocalcaemia

1.3 Identifying at Risk Patients

The most important point is to **recognise patients who are potentially at risk**. The highest risk occurs in the most malnourished individual, but refeeding syndrome can occur in any patient where nutrition (enteral or parenteral) is restarted after a period of decreased intake. Paediatric patients may be at risk after a much shorter time period than adults. The highest risk is in the first 4 days after feeding is re-started but refeeding syndrome may develop up to 2 weeks after restarting nutrition.

Patients especially at risk include:

- Severe underweight (Body Mass Index <5th centile for age),
- Acute weight loss of 5-10% in past 1-2 months ,
- No enteral nutrition for 7-10 days or major stressors without food for several days,
- Abnormal electrolytes prior to refeeding (phosphate, potassium, magnesium),
- Prolonged and severe vomiting,
- Prolonged QTc interval on ECG,
- Pre-existing cardiac or respiratory conditions (these patients may need HDU).

Potentially high-risk clinical groups include:

- Anorexia nervosa.
- Oncology patients and patients undergoing chemotherapy or bone marrow transplant
- Post-operative patients.
- Chronic malabsorption syndromes.
- Chronic malnutrition – especially consider in patients with neurological and gastrointestinal disorders.

2 Summary of Recommendations

The following may reduce the risk of development of refeeding syndrome:

1. Recognise at risk patients: remember that a short period of fasting or under-nutrition can lead to refeeding syndrome in paediatric patients.
2. Refer to dietitian early for appropriate assessment and nutritional prescription.
3. Supplement thiamine and multivitamins in all patients at risk prior to refeeding and consider phosphate supplementation. Monitor and supplement other electrolytes as required.
4. For those at risk, caloric intake should be restricted and feeding should be commenced slowly, with caloric intake spread over the day and increased gradually according to clinical stability.
5. Feeds may need to be temporarily reduced or even ceased if electrolyte or clinical instability occurs.
6. Refeeding syndrome can occur up to 2 weeks post initiation of enteral or parenteral nutrition.
7. Monitor regularly – including weight, biochemistry, fluid balance and cardiovascular stability.
8. The main biochemical abnormality is hypophosphataemia. In addition hypokalaemia, hypomagnaesaemia, hypoglycaemia, sodium and fluid retention and thiamine deficiency may develop.
9. Clinical signs of refeeding syndrome include acute cardiac failure, fluid imbalance, delirium, arrhythmias, seizures and sudden death.

3 Management Guideline

- Identify person as **at risk of refeeding syndrome**, document in medical notes and refer to dietitian urgently for nutritional assessment and prescription prior to commencing oral or parenteral nutrition.
- Collect recent weight history.
- Calculate BMI and plot on BMI percentile charts.

Baseline investigations and clinical assessment:
- Full Blood Count, Na, K, Ur, Cr, bicarbonate, Ca, Mg, PO4, glucose, albumin and liver function tests (LFT), CK, zinc, B12, folate, iron studies.
- ECG, full medical assessment particularly focusing on cardiovascular stability, neurological and macro and micronutrient assessment.

Correct **electrolyte abnormalities** before refeeding, aiming for mid normal range.

Refer sub-specialities if appropriate (e.g. cardiology if abnormal ECG, ICU for e.g. patients with pre-existing respiratory or cardiac conditions).

Prescribe **supplements** before starting refeeding (see Table 2)
- thiamine
- multi-vitamin/ mineral supplement
- +/- phosphate

Critical levels – seek urgent senior advice:
- PO4 <0.8 mmol/l, K < 3 mmol/L
- Mg <0.6mmol/L, BSL <3 mmol/L
- Temperature <35.5, postural BP drop >15 mmHg, QTc > 450msec

Nutrition prescription by dietitian or, if after hours, see Table 3.

Monitoring during refeeding
- Monitor HR, RR, BP and BSL (initially 4- 6 hourly). Consider pulse oximetry and cardiac monitoring if required.
- Monitor fluid input and output and carefully control access to additional fluids. Repeat ECG as required.
- Review at least BD initially - especially monitoring cardiovascular, neurological, mental and respiratory status and fluid balance.
- Check electrolytes initially at least daily (being guided by results). Note electrolyte disturbances can occur up to 2 weeks post commencement of feeding. Adjust supplements as required aiming for middle of normal range.
-Weigh initially daily (first 4 days) then twice weekly (excessive weight gains may indicate fluid retention)

Clinically stable, electrolytes stable for at least 24 hours

Electrolytes drop but still in normal range, clinically stable
- Do not increase feeds
- Correct electrolytes
- Recheck electrolytes at least every 24 hours.

Electrolytes drop outside normal range or any signs or symptoms of refeeding syndrome develop
- Discuss with senior staff, reduce or consider ceasing feeds
- Correct electrolytes and stabilise clinically
- Recheck electrolytes at least every 24 hours

Guided by dietitian increase feeds by 10-20% caloric increments until final requirements are met.

Continue supplementation and monitoring for refeeding syndrome at least until electrolytes and clinical status are stable. The greatest risk is in the first 4 days but problems may occur up to 2 weeks after starting feeds. Consider ceasing supplementation when intake meeting RDI (recommended dietary intake).

Table 2: Electrolyte/Vitamin supplementation in children at risk of refeeding syndrome

Supplement	Dosing	Additional notes
Thiamine	1-2mg/ kg (maximum adult dose 100mg daily), preferably orally. Give daily for first week. Administer at least 30 minutes prior to refeeding.	Oral route preferred, as potentially serious allergic adverse reactions may occur during, or shortly after, parental administration. Intravenous injection should be administered slowly (over 10 minutes) and facilities for treating anaphylaxis should be available when administering.
Multivitamin with trace elements	To meet RDI, give daily, preferably by oral route, e.g: - 0-3 years: Penta-vite Liquid Multivitamins for Infants 0.15mL/day orally increasing by 0.15mL/day to max 0.45mL/day. - 3-12 years: Penta-vite Chewable Multivitamins for Kids 1 tablet/day or Pentavite Liquid Multi-vitamins with Iron 5mL/day. - > 12 years: Centrum 1 tablet/day.	
Phosphate	Serum levels should be closely monitored and doses increased or decreased accordingly. For patients at high risk of refeeding syndrome prophylactic oral phosphate for the first week could be considered. Several adolescent and adult guidelines recommend 1-2 tablets of oral Sandoz phosphate / day as a prophylactic dose (1 Sandoz phosphate contains 500mg of phosphorus or 16.1mmol phosphate). Recommended doses of oral phosphate for hypophosphataemia in children is 2-3mmol/kg (maximum 97mmol) phosphate daily in 2-4 divided doses, adjusted as necessary.	Phosphate may need to be given intravenously if hypophosphataemia is severe as large doses of oral phosphate may cause diarrhoea and intestinal absorption may be unreliable. Intravenous phosphate should be diluted to 0.05mmol PO4/mL or weaker for peripheral infusion. Compatible iv fluids include 5% glucose or 0.9% Sodium Chloride. Maximum phosphate infusion rate is 0.2mmol/kg/hr, even if given as KH_2PO_4. Side effects of hyperphosphataemia include nausea, diarrhoea, hypotension, oedema, hypocalcaemia, acute renal failure, phlebitis and extravasation injury.

Table 3: Initial Refeeding Prescription

If a dietician is not available the following guidelines are recommended to be used for the initial refeeding period at the discretion of the medical team in charge. For patients with co-morbidities such as renal failure, or intolerances, alternative feeds may be more appropriate:

- Weigh patient or estimate patient's weight as accurately as possible
- Calculate starting energy prescription (see table below)

Age	Starting prescription (50% of estimated total energy requirements)
0-1 years	70-80 mL/kg of EBM/ standard infant formula
1-7 years	50-65 mL/kg of pediasure
7-10 years	40-50 mL/kg of pediasure
11-14 years	40 mL/kg of osmolite
15 years +	30mL/kg of osmolite

Patients can be maintained on this caloric intake for 2 – 3 days until reviewed by the dietician.

4 Bibliography

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