NHS Grampian

NHS Grampian Staff Guideline for the Management of Hypophosphataemia in Adults

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Medicines Information Pharmacist	See Page 5	Medicine Guidelines and Policies Group
Signature: 		**Signature:** 
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Corporate: Senior Managers
Departmental: Heads of Service/Clinical Leads
Area: Line Managers
Hospital/Interface services: Assistant General Managers and Group Clinical Directors
Operational Management Unit: Unit Operational Managers

Policy statement: It is the responsibility of all staff to ensure that they are working to the most up to date and relevant policies, protocols procedures.

Review: This policy will be reviewed in two years or sooner if current treatment recommendations change

Responsibilities for review of this document: Medicine Information Pharmacist

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Revision History:

Revision Date	Previous Revision Date	Summary of Changes (Descriptive summary of the changes made)	Changes Marked* (Identify page numbers and section heading)
May 2020	September 2018	Separated causes of hypophosphataemia into three sections.	Page 4 – Causes of Hypophosphataemia
May 2020	September 2018	Myopathy and seizures added as signs of hypophosphataemia.	Page 5 – Signs and Symptoms of Hypophosphataemia
May 2020	September 2018	Addition of sodium glycerophosphate as an alternative to polyfusor®	Page 7 – Intravenous Phosphate Replacement Therapy
May 2020	September 2018	Removal of recommendation of 50% reduction in dose in renal impairment	Page 5 – Precautions and Monitoring
May 2020	September 2018	Monitoring requirements now listed as bullet points.	Page 7 – Monitoring during IV administration.
April 2022	September 2018	Addition of sentence to state that serum phosphate level should be checked before treating.	Page 4 – The Management of Acute Hypophosphataemia in Adults
April 2022	September 2018	Addition of hyperlinks to relevant sections.	Page 6 – Dosage and Administration
April 2022	September 2018	Amended section title.	Page 6 - Oral Phosphate Replacement Therapy for Mild or Moderate Asymptomatic Hypophosphataemia
April 2022	September 2018	Amended section title.	Page 7 - Intravenous Phosphate Replacement Therapy

Revision Date	Previous Revision Date	Summary of Changes (Descriptive summary of the changes made)	Changes Marked* (Identify page numbers and section heading)
			For Symptomatic or Severe Hypophosphataemia
April 2022	September 2018	Amended title of final column to cover all patients over 81kg.	Page 7 - Intravenous Phosphate Replacement Therapy For Symptomatic or Severe Hypophosphataemia
April 2022	September 2018	Added hyperlink to monitoring information.	Page 8 - Sodium Glycerophosphate 21.6% concentrate for solution for infusion
April 2022	September 2018	Amended section title.	Page 9 – Adverse effects of phosphate replacement therapy (oral and IV)
April 2022	September 2018	Formatted table.	Page 7 - Intravenous Phosphate Replacement Therapy For Symptomatic or Severe Hypophosphataemia
April 2022	September 2018	Updated references.	Page 9 - References

* Changes marked should detail the section(s) of the document that have been amended, i.e. page number and section heading.

NHS Grampian Staff Guideline for the Management of Hypophosphataemia in Adults

This guideline is for use within primary or secondary care in NHS Grampian. Intravenous phosphate replacement should only be used in an acute setting, as outlined below. Specialist areas may use an alternative replacement regimen (e.g. Gastroenterology) or alternative intravenous phosphate preparations (e.g. ICU, Haematology, Oncology). Alternative intravenous preparations are restricted to these areas due to their high potassium content.

The NHS Grampian reference range for serum phosphate in patients over 16 years of age is 0.8 - 1.5 mmol/L. Serum phosphate level should be checked before commencing any treatment for hypophosphataemia.

Table 1. Serum phosphate classification

Normal (0.8 - 1.5 mmol/L)	**Mild** (0.6 - 0.79 mmol/L)	**Moderate** (0.3 - 0.59 mmol/L)	**Severe** (<0.3 mmol/L)

Causes of Hypophosphataemia[1, 2, 3, 9]

Wherever possible, the cause of hypophosphataemia should be identified and corrected.

There are four major mechanisms by which hypophosphataemia can occur:

1) Redistribution of phosphate into cells

- Refeeding syndrome
- Severe diabetic ketoacidosis
- Severe respiratory alkalosis
- Hepatic failure
- Septicaemia
- Medication e.g. catecholamines, insulin

2) Decreased intestinal absorption of phosphate

- Inadequate dietary intake
- Malnutrition due to malabsorption or persistent vomiting
- Vitamin D deficiency
- Chronic diarrhoea
- Medication e.g. antacids (phosphate binder)

3) Increased renal phosphate excretion

- Alcoholism
- Medication e.g. acetazolamide, theophylline, diuretics
- Primary hyperparathyroidism
- Metabolic acidosis
- Removal by renal replacement therapies.

Signs and Symptoms of Hypophosphataemia[1-5, 9]

Hypophosphataemia is often asymptomatic but clinical symptoms are more common when the serum phosphate level is below 0.3 mmol/L.

Symptoms may include:

- Muscle weakness
- Rhabdomyolysis (more likely in alcoholic patients)
- Myopathy
- Haematological abnormalities
- Respiratory failure
- Cardiomyopathy
- Arrhythmias
- Seizures*
- Paraesthesia
- Confusion
- Coma
- Encephalopathy.

*Please note there is some evidence to suggest transient hypophosphataemia may occur as a result of a patient having a seizure, in particular generalised tonic-clonic seizures, which may not require replacement[13]. Please contact neurology for advice.

Precautions and Monitoring[3-8, 14]

Phosphate should be used cautiously in patients with severe renal impairment as phosphate is renally excreted. A dose reduction may be required – discuss with clinical pharmacist or renal specialists.

Some care is necessary with the interpretation of serum phosphate results as concentration falls transiently after high carbohydrate meals and substantial diurnal variation exists.

The rise in serum phosphate levels from any form of phosphate replacement therapy cannot be predicted. Therefore, monitoring is required.

Phosphate administration may lead to hypocalcaemia.

Consideration should be given to the potassium and sodium content of phosphate replacement therapies (listed under individual replacement therapies below).

Monitor electrolytes (i.e. phosphate, calcium, potassium, sodium and magnesium) frequently e.g. 6-12 hourly during IV administration. Continue to monitor for several days after acute replacement.

Dosage and Administration[6-11]

Table 2. Treatment guidance

Severity of hypophosphataemia	Phosphate Level	Management required
Mild	0.6 – 0.79mmol/L and asymptomatic	Oral replacement can be considered
Mild	0.6 – 0.79mmol/L AND symptomatic	Intravenous replacement
Moderate	0.3 – 0.59mmol/L and asymptomatic	Oral replacement
Moderate	0.3 – 0.59mmol/L AND symptomatic	Intravenous replacement
Severe	<0.3mmol/L	Intravenous replacement

Oral Phosphate Replacement Therapy for Mild or Moderate Asymptomatic Hypophosphataemia:

Phosphate-Sandoz[5,6]

Each tablet contains 16.1mmol phosphate, 20.4mmol sodium and 3.1mmol potassium

- 1-2 tablets up to 3 times a day (maximum 6 tablets per day).
- Monitor serum phosphate daily in secondary care. In primary care, monitor serum phosphate every 3-4 days or more frequently if clinically indicated.
- Adjust dose according to response.

Use of Phosphate Sandoz to treat hypophosphataemia is off-label (except where hypophosphataemia is associated with vitamin D resistant rickets and vitamin D resistant hypophosphataemic osteomalacia), but no other UK licensed oral preparations are available.

Patients with enteral feeding tubes who require enteral phosphate replacement should be discussed with the clinical pharmacist.

Note:

- Do not give at the same time as antacids, as this may reduce absorption of phosphate and therefore reduce efficacy.
- Diarrhoea is a common side-effect – give with plenty of water to minimise risk. Reduce the dose if this occurs.

Intravenous Phosphate Replacement Therapy For Symptomatic or Severe Hypophosphataemia:

Phosphates Polyfusor®[1, 5,11,12]

500mL Polyfusor® contains 50mmol phosphate, 81mmol sodium and 9.5mmol potassium

Doses below are for patients with normal renal function.
(Table adapted from UKMi, Tayler *et al*, and Polyfusor® SPC)

Administer appropriate dose over 6 – 12 hours.

Table 3. Suggested doses of Phosphates Polyfusor®

Serum phosphate concentration (mmol/L)	Weight 40 - 60kg		Weight 61 - 80kg		Weight 81kg and over	
	Amount of phosphate	**Volume of Polyfusor®**	**Amount of phosphate**	**Volume of Polyfusor®**	**Amount of phosphate**	**Volume of Polyfusor®**
< 0.3 Severe	30mmol	300mL	40mmol	400mL	50mmol	500mL
0.3 – 0.59 Moderate	20mmol	200mL	30mmol	300mL	40mmol	400mL
0.6 - 0.79 Mild (if oral route not suitable or patient is symptomatic)	10mmol	100mL	15mmol	150mL	20mmol	200mL

Additional Prescribing Notes:

- Take care to ensure that only the prescribed volume is delivered from the Polyfusor®. Discard the remainder.
- Max flow rate: 15mmol per hour (150mL per hour).
- Maximum of 50mmol (500mL) per day .
- Patients with severe hypophosphataemia may require repeat infusions.
- Use a dedicated IV lumen for Polyfusor® as it may cause precipitation if administered with other drugs. It may be administered peripherally.

Monitor during IV administration:

- Electrolytes (i.e. phosphate, calcium, potassium, sodium and magnesium) frequently e.g. 6-12 hourly
- Renal function
- Blood pressure
- Fluid balance
- ECG
- Acid-base balance

Sodium Glycerophosphate 21.6% concentrate for solution for infusion[12,15]

Sodium glycerophosphate 21.6% can be used as an alternative to Phosphates Polyfusor® if there are supply issues with the Polyfusor®.

Sodium Glycerophosphate 21.6% concentrate for solution for infusion should not be given to patients in a state of dehydration or with hypernatraemia, hyperphosphataemia, severe renal insufficiency or shock.

Each 20mL vial contains 20mmol phosphate and 40mmol sodium and **must be diluted prior to use with sodium chloride 0.9% or glucose 5%.**

Doses below are for patients with normal renal function.

Administer appropriate dose over at least 8 hours.

Table 4. Suggested doses of sodium glycerophosphate 21.6%

For Peripheral Administration (Max concentration 0.1mmol/ml Phosphate)						
Serum phosphate concentration (mmol/L)	**Weight 40 - 60kg**		**Weight 61 - 80kg**		**Weight 81 - 120kg**	
	Volume of sodium glycero-phosphate 21.6% concentrate for infusion	Suggested dilution volume	**Volume of sodium glycero-phosphate 21.6% concentrate for infusion**	Suggested dilution volume	**Volume of sodium glycero-phosphate 21.6% concentrate for infusion**	Suggested dilution volume
< 0.3 Severe	30mL= 30mmol	500mL (0.06mmol /mL)	40mL= 40mmol	500mL (0.08mmol /mL)	50mL= 50mmol	500mL (0.1mmol/ mL)
0.3 – 0.59 Moderate	20mL= 20mmol	250mL (0.08mmol /mL)	30mL= 30mmol	500mL (0.06mmol /mL)	40mL= 40mmol	500mL (0.08mmol /mL)
0.6 - 0.79 Mild (if oral route not suitable or patient is symptomatic)	10mL= 10mmol	100mL (0.1mmol/ mL)	15mL= 15mmol	250mL (0.06mmol /mL)	20mL= 20mmol	250mL (0.08mmol /mL)

Additional Prescribing Notes:

- If a more concentrated solution is to be given (i.e. 0.2-0.4mmol/mL) then this must be given centrally due to high osmolality
- Monitoring as for Phosphates Polyfusor®.

Adverse effects of phosphate replacement therapy (oral and IV)[1, 3, 5, 7]

- Diarrhoea – may require dose reduction
- Hyperphosphataemia (particularly in patients with renal failure)
- Hypocalcaemia
- Hyperkalaemia (due to potassium content of replacement therapy)
- Hypernatraemia
- Metastatic calcification
- Acute renal failure
- Hypotension
- Nausea and vomiting
- Oedema
- Phlebitis
- Dehydration

If any of these adverse effects occur, contact the prescriber for advice as the phosphate treatment may need to be amended.

Consultation Group

Sarah O'Beirne	Lead Medicines Information Pharmacist
Dr Bill Simpson	Consultant Biochemist
Brian Porteous	Renal pharmacist
Alison Smith	Medicines Management Pharmacist

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