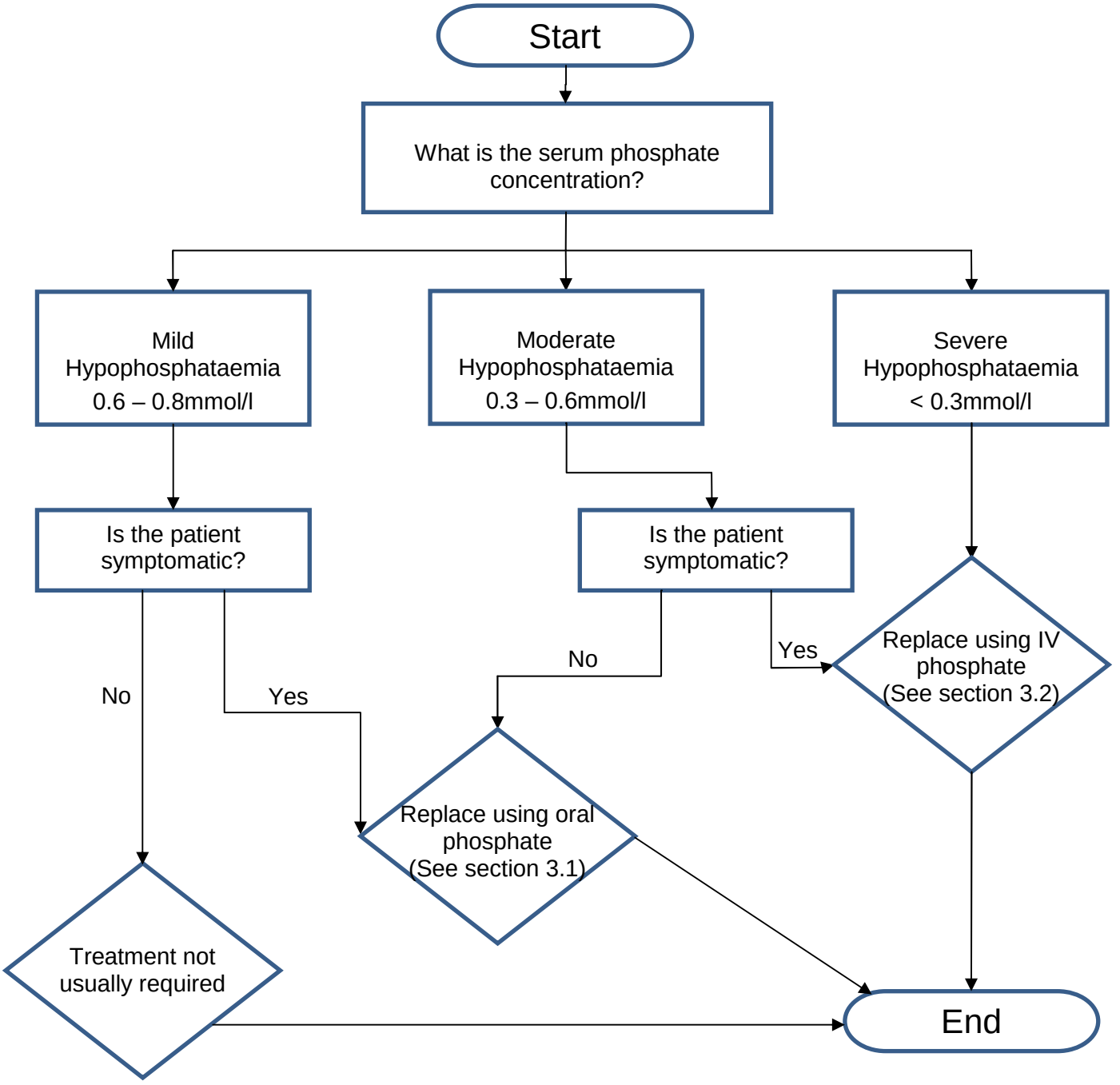
# CLINICAL GUIDELINE FOR THE MANAGEMENT OF HYPOPHOSPHATAEMIA IN ADULTS

## Summary.

**Key:**

| | |
|---|---|
| General Notes | GP/SWASFT |
| ED/MAU/SRU/Acute GP/Amb-Care | In-patient wards |



# 1. Aim/Purpose of this Guideline

**1.1.** To provide clinical staff with guidance relating to the management of hypophosphataemia in adults.

# 2. Introduction

## 2.1. What is hypophosphataemia?

2.1.1. The reference range for serum phosphate used in the Royal Cornwall Hospitals Trust is 0.8 – 1.5 mmol/L.

2.1.2. For the purposes of this guideline, hypophosphataemia is defined as a serum blood phosphate concentration of less than 0.8 mmol/L.

## 2.2. Causes of hypophosphataemia.

2.2.3. There are four major mechanisms by which hypophosphataemia can occur:

2.2.3.1. Redistribution of phosphate into cells from extracellular fluid *(respiratory alkalosis, refeeding syndrome, drug therapy such as insulin, adrenaline/noradrenaline, sepsis, malignancy, recovery from diabetic ketoacidosis, surgery, hepatic failure).*

2.2.3.2. Decreased intestinal absorption of phosphate *(reduced or inadequate intake, chronic diarrhoea, vitamin D deficiency, malabsorption through use of antacids, phosphate binders or niacin).*

2.2.3.3. Increased urinary phosphate excretion *(hyperparathyroidism, metabolic or respiratory acidosis, alcohol abuse, hypercalcaemia, drug therapy e.g. diuretics, aminoglycosides, steroids, antiretrovirals)*.

2.2.3.4. Removal by renal replacement therapies.

## 2.3. Signs and Symptoms.

2.3.4. Manifestations of hypophosphataemia depend upon the severity and chronicity of phosphate depletion. Symptomatic hypophosphataemia is usually observed when plasma phosphate falls below 0.3 mmol/L.

2.3.5. Symptoms may include:

2.3.5.1. Muscoskeletal - *myopathy, rhabdomyolysis, (muscle-) weakness.*

2.3.5.2. Respiratory - *respiratory failure.*

2.3.5.3. Cardiovascular - *arrhythmias, cardiomyopathy, acute heart failure.*

2.3.5.4. Neurological - *irritability, paresthesias, delirium, seizures, metabolic encephalopathy, coma.*

2.3.5.5. Haematological - *red cell, white cell and platelet dysfunction leading to anaemia, infection and bleeding.*

2.3.5.6. Other - *osteomalacia leading to bone pain, insulin resistance, ileus, renal tubular failure.*

# 3. Treatment.

## 3.1. Points to consider:

3.1.1. There are no national guidelines for the treatment of acute hypophosphataemia.

3.1.2. The underlying cause of hypophosphataemia should be identified and corrected before phosphate supplementation.

3.1.3. Treatment should be established on an individual patient basis, taking into account serum phosphate concentration, the presence or absence of symptoms, as well as the overall clinical picture.

3.1.4. In some cases, moderate hypophosphataemia upon initial presentation is due to redistribution and hyperventilation and will normally self-correct. However, this must be distinguished from refeeding syndrome, where there is true body depletion and correction with phosphate replacement is required.

## 3.2. Oral phosphate administration.

For use in:

3.2.5. Mild hypophosphataemia (0.6 – 0.8 mmol/L).

3.2.5.1. If asymptomatic mild hypophosphataemia, determine if phosphate replacement is considered clinically necessary or if patient has risk factors for further phosphate depletion before prescribing phosphate supplementation.

3.2.6. Asymptomatic moderate hypophosphataemia (0.3 - 0.6 mmol/l).

**Table 1: Oral phosphate preparation suitable for use at RCHT**

| Preparation | Route | Contents of 1 tablet (mmol) | | | Dose |
|---|---|---|---|---|---|
| | | Phosphate | Sodium | Potassium | |
| Phosphate Sandoz Effervescent Tablets | Oral | 16.1 | 20.4 | 3.1 | 1 to 2 tablets three times a day |

3.2.7. Phosphate Sandoz Effervescent Tablets should be dissolved in approximately 75mls of water and taken orally.

3.2.8. Review phosphate levels daily and adjust dose according to response.

### 3.3. Intravenous phosphate replacement.

For use in:

3.3.9. Symptomatic moderate hypophosphataemia (0.3 - 0.6 mmol/l) or in patients unable to tolerate oral supplements.

3.3.10. Severe hypophosphataemia (< 0.3mmol/l).

**Table 2: Intravenous phosphate preparation suitable for use at RCHT**

| Preparation | Route | Each 500ml polyfusor contains (mmol) | | | Dose |
|---|---|---|---|---|---|
| | | Phosphate | Sodium | Potassium | |
| Phosphate Polyfusor 500ml | IV | 50 | 81 | 9.5 | See table 3 |

3.3.11. Doses for intravenous phosphate replacement vary in the literature.

3.3.12. Suggested regimens include a range of 0.2 - 0.5mmol/kg/day.

3.3.13. Table 3 gives some suggested doses of Phosphate Polyfusor based on weight in patients with normal renal function.

**Table 3: Suggested doses of Phosphate Polyfusor**

| Serum phosphate concentration (mmol/L) | Weight 40 – 60kg | | Weight 61 – 80kg | | Weight 81 – 120kg | |
|---|---|---|---|---|---|---|
| | Amount of phosphate (mmol) | Volume of phosphate (ml) | Amount of phosphate (mmol) | Volume of phosphate (ml) | Amount of phosphate (mmol) | Volume of phosphate (ml) |
| < 0.3 (severe) | 25 | 250 | 35 | 350 | 50 | 500 |
| 0.3 – 0.6 (moderate | 10 | 100 | 15 | 150 | 20 | 200 |

3.3.14. Intravenous phosphate is usually given over 12 - 24 hours.

3.3.15. If necessary can be given over 6 - 12 hours.

3.3.16. A total maximum dose of 50mmol in 24 hours should not be exceeded.

3.3.17. Not more than 15 mmol phosphate/hour should be given.

# 4. Monitoring during intravenous replacement.

The following should be monitored every 6 - 12 hours during intravenous phosphate replacement:

**4.1. Urea and electrolytes including bone profile with special attention to the following:**

4.1.1. *Phosphate*

4.1.1.1. Rapid or excessive phosphate replacement though intravenous dosing can lead to hyperphosphataemia.

4.1.1.2. Phosphate is an intracellular anion and therefore serum concentrations are not an exact measurement of total body stores.

4.1.2. *Calcium*

4.1.2.1. Hyperphosphataemia can lead to subsequent hypocalcaemia through calcium binding.

4.1.2.2. Calcium-phosphate precipitation in soft tissue may cause hypotension and organ damage and can result in acute renal failure.

4.1.3. *Magnesium*

4.1.3.1. Administration of intravenous phosphate can lead to hypomagnesaemia.

4.1.4. *Potassium*

4.1.4.1. Potassium is present in phosphate replacement preparations; they should therefore be administered with caution to patients with cardiac disease or conditions predisposing to hyperkalaemia.

4.1.5. *Sodium*

4.1.5.1. Note sodium content of Phosphate Polyfusor, particularly in hypertensive patients, or those with heart failure or oedema.

**4.2. Renal function.**

4.2.6. Phosphate is renally cleared and can therefore accumulate in renal impairment, causing hyperphosphataemia. See also point 6 below.

**4.3. ECG and blood pressure.**

4.3.7. Intravenous phosphate can potentially lead to arrhythmias and hypotension.

# 5. Adverse effects of phosphate replacement.

**5.1.** Oral phosphate can cause gastro-intestinal upsets, nausea and diarrhea.

**5.2.** Intravenous phosphate replacement can cause electrolyte disturbances (*hyperphosphataemia, hyperkalaemia, hypernatraemia, hypocalcaemia*), cardiovascular side-effects (*hypotension, arrhythmias, cardiac arrest*), AKI and injection site reactions.

# 6. Special Instructions.

**6.1.** Reduced doses may be necessary in patients with impaired renal function - seek renal team input.

**6.2.** Phosphate binders such as aluminium, magnesium or calcium salts and sevelamer should be stopped.

**6.3.** Patients with current hypocalcaemia should have their calcium corrected before replacing phosphate to prevent further hypocalcaemia.

**6.4.** Phosphate Polyfusors should not be infused via the same line as infusions containing metal ions such as magnesium and calcium due to incompatibility issues resulting in precipitation.

**6.5.** Do not give oral and IV phosphate supplements concomitantly

# 7. Monitoring compliance and effectiveness

| | |
|---|---|
| Element to be monitored | Clinical Guideline for the Management of Hypophosphataemia in Adults. |
| Lead | Medications Safety Pharmacist. |
| Tool | An audit tool will be developed to monitor compliance.<br><br>Datix will be used to identify clinical incidents. |
| Frequency | The policy will be monitored every three years, or sooner as clinical incidents dictate. |
| Reporting arrangements | The audit results will be reported to the Medication Practice Committee (MPC) and the individual areas audited/<br><br>Clinical incidents on Datix will be reported to the senior nurse/manager in that area and will also be reported to the Medication Safety Group. |
| Acting on recommendations and Lead(s) | The MPC will co-ordinate the actions to the audit results. Actions from incident reports will be at a local level and may also resulting broader actions, co-ordinated by the Medication Safety Group. |
| Change in practice and lessons to be shared | Required changes to practice will be identified and actioned within the time frame specified in the action plan. |

# 8. Equality and Diversity

**8.1.** This document complies with the Royal Cornwall Hospitals NHS Trust service Equality and Diversity statement which can be found in the 'Equality, Diversity & Human Rights Policy' or the Equality and Diversity website.

### *8.2. Equality Impact Assessment*

The Initial Equality Impact Assessment Screening Form is at Appendix 2.

# Appendix 1. Governance Information

| | | | | |
|---|---|---|---|---|
| **Document Title** | Clinical Guideline for the Management of Hypophosphataemia in Adults. | | | |
| **Date Issued/Approved:** | 4 August 2017. | | | |
| **Date Valid From:** | 4 August 2017. | | | |
| **Date Valid To:** | 4 August 2020 | | | |
| **Directorate / Department responsible (author/owner):** | Lisa Thomas, Medicines Information.<br>Bronwin Staple, Medicines Information.<br>Simon Fleming, Consultant Biochemist.<br>Ann Cardell, Medication Safety. | | | |
| **Contact details:** | 01872 252587 | | | |
| **Brief summary of contents** | Guideline on the diagnosis and treatment of hypophosphataemia. | | | |
| **Suggested Keywords:** | Hypophosphataemia, phosphate, electrolyte, electrolytes, refeeding. | | | |
| **Target Audience** | RCHT | PCH | CFT | KCCG |
| | ✓ | | | |
| **Executive Director responsible for Policy:** | Medical Director. | | | |
| **Date revised:** | N/A | | | |
| **This document replaces (exact title of previous version):** | N/A | | | |
| **Approval route (names of committees)/consultation:** | Medication Practice Committee, Pharmacy, Biochemistry. | | | |
| **Divisional Manager confirming approval processes** | *Head of relevant Division* | | | |
| **Name and Post Title of additional signatories** | Not Required. | | | |
| **Name and Signature of Divisional/Directorate Governance Lead confirming approval by specialty and divisional management meetings** | {Original Copy Signed} | | | |
| | Name: | | | |
| **Signature of Executive Director giving approval** | {Original Copy Signed} | | | |
| **Publication Location (refer to Policy on Policies – Approvals and** | Internet & Intranet | | Intranet Only | ✓ |

| | | | | |
|---|---|---|---|---|
| **Ratification):** | | | | |
| **Document Library Folder/Sub Folder** | Clinical / Pharmacy. | | | |
| **Links to key external standards** | None. | | | |
| **Related Documents:** | | | | |
| **Training Need Identified?** | No. | | | |

**Version Control Table**

| Date | Version No | Summary of Changes | Changes Made by *(Name and Job Title)* |
|---|---|---|---|
| Aug 2017 | V1.0 | Initial Issue | Bronwin Staple<br>Lead Pharmacist<br>Medicines Information |
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**This document is to be retained for 10 years from the date of expiry.**

**This document is only valid on the day of printing**

**Controlled Document**

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# Appendix 2. Initial Equality Impact Assessment Form

| | |
|---|---|
| Name of Name of the strategy / policy /proposal / service function to be assessed (hereafter referred to as *policy*) (Provide brief description): | |
| Directorate and service area:<br>All clinical areas | Is this a new or existing *Policy?*<br>New policy |
| Name of individual completing assessment:<br>Bronwin Staple | Telephone:<br>**01872 252587** |
| 1. *Policy* Aim*<br><br>*Who is the strategy / policy / proposal / service function aimed at?* | To provide guidance on the diagnosis and management of hypophosphataemia. |
| 2. *Policy* Objectives* | To ensure the safe treatment of hypophosphataemia. |
| 3. *Policy* – intended Outcomes* | Treatment of hypophosphataemia complies with the guidance set out in this document. |
| 4. *How will you measure the outcome? | Ongoing audit. |
| 5. Who is intended to benefit from the *policy*? | Hypophosphataemic patients and the clinical staff treating them. |
| 6a) Is consultation required with the workforce, equality groups, local interest groups etc. around this policy?<br><br>b) If yes, have these *groups been consulted?<br><br>C). Please list any groups who have been consulted about this procedure. | No.<br><br>Medications Safety Group, Medicines Information, Biochemistry. |

**7. The Impact**
Please complete the following table.

Are there concerns that the policy **could** have differential impact on:

| Equality Strands: | Yes | No | Rationale for Assessment / Existing Evidence |
|---|---|---|---|
| **Age** | | ✓ | Policy for all patients |
| **Sex** (male, female, trans-gender / gender reassignment) | | ✓ | Policy for all patients |
| **Race / Ethnic communities /groups** | | ✓ | Policy for all patients |
| **Disability -** learning disability, physical disability, sensory impairment and mental health problems | | ✓ | Policy for all patients |
| **Religion / other beliefs** | | ✓ | Policy for all patients |
| **Marriage and civil partnership** | | ✓ | Policy for all patients |
| **Pregnancy and maternity** | | ✓ | Policy for all patients |
| **Sexual Orientation,** Bisexual, Gay, heterosexual, Lesbian | | ✓ | Policy for all patients |

You will need to continue to a full Equality Impact Assessment if the following have been highlighted:

- You have ticked "Yes" in any column above and
- No consultation or evidence of there being consultation- this excludes any *policies* which have been identified as not requiring consultation**. or**
- Major service redesign or development

| 8. Please indicate if a full equality analysis is recommended. | **Yes** | **No** ✓ |
|---|---|---|

9. If you are **not** recommending a Full Impact assessment please explain why.

| Signature of policy developer / lead manager / director | Date of completion and submission<br><br>August 2017 |
|---|---|

| Names and signatures of members carrying out the Screening Assessment | 1. Liam Kelly<br>2. Bronwin Staple<br>3. Simon Fleming | |
|---|---|---|

**Keep one copy and send a copy to the Human Rights, Equality and Inclusion Lead**
c/o Royal Cornwall Hospitals NHS Trust, Human Resources Department, Knowledge Spa, Truro, Cornwall, TR1 3HD

A summary of the results will be published on the Trust's web site.

Signed __ _____

Date _____