Phosphate Supplementation in Adults Guideline

1. Purpose

The purpose of this guideline is to provide guidance and minimum requirements for prescribing, administration and monitoring of patients requiring phosphate supplementation throughout the WA Country Health Service (WACHS). This guideline is part of the suite of policy documents related to high-risk medications in WACHS. Refer to the WACHS High Risk Medications Procedure for further information.

For clinical guidance in specific populations see the following:

- neonates, refer to the Women and Newborn Health Service Phosphate (Buffered) Neonatal (health.wa.gov.au)
- paediatric patients, refer to the Perth Children's Hospital Phosphate guideline
- refeeding syndrome management, refer to:
  - WACHS Nutrition and Hydration Procedure
  - Perth Children's Hospital Refeeding Syndrome Prevention and Management in Malnourished Children
- parenteral nutrition, refer to the
  - WACHS Adult Total Parenteral Nutrition Procedure
  - WACHS Adult Peripheral Parenteral Nutrition Procedure
  - Obstetric patients, refer to the Women and Newborn Health Service Peripheral Parenteral Nutrition (PPN) guideline

2. Guideline

ATTENTION

- Potassium dihydrogen phosphate ampoules/vials are high concentration potassium products and a **HIGH RISK** medicine.
- Hyperkalaemia can develop rapidly, asymptomatically and is potentially fatal if administered as a large bolus dose[1-4].
- To avoid toxicity from a large bolus dose, mix the infusion bag thoroughly by inverting and shaking several times prior to administration[4].
- There are three other products with different potassium and phosphate content available. Check product selection carefully. For more information see the Australian Injectable Drugs Handbook (AIDH) Phosphate preparations: comparative information[4].

Refer to Potassium Supplementation Procedure for further details

2.1 Indication [3, 5-8]

Hypophosphataemia (< 0.8 mmol/ L) including patients at risk (note: Pathwest lower limit is 0.75 mmol/ L) may result from:

- chronic losses such as diuretics, salt wasting, vitamin D deficiency, hyperparathyroidism

- inadequate absorption, e.g. malnutrition, chronic diarrhoea, medications
- intracellular shift e.g. Refeeding syndrome, hungry bone syndrome post parathyroidectomy
- removal via dialysis.

The underlying cause of hypophosphatemia should be identified and treated. Moderate hypophosphataemia (0.3-0.6mmol/L) with symptoms may need supplements. Acute severe hypophosphataemia (<0.3mmol/L) can cause serious problems like muscle weakness, cardiac arrhythmias, or even death, and must be treated with intravenous phosphate supplementation in a monitored setting.

2.2 Contraindications

Absolute contraindications[2-6,9,19]

Absolute contraindications include the following:

- Hyperphosphataemia (defined by a serum phosphate concentration higher than 1.5 mmol/L).
- Hypocalcaemia – must be corrected prior to phosphate administration.
- Hyperkalaemia – do not administer potassium dihydrogen phosphate.
- Hypernatraemia – do not administer sodium dihydrogen phosphate to patients with significant hypernatraemia.

Relative contraindications[2-6,9]

Relative contraindications include the following:"

- guidance varies in phosphate use in renal impairment, consider senior medical review
- patients at risk of developing hyperphosphataemia or hypocalcaemia (e.g. severe renal impairment GFR < 30 mL/min, hypoparathyroidism, rhabdomyolysis, extensive tissue damage, acute dehydration, osteomalacia, rickets, acute pancreatitis)
- potassium dihydrogen phosphate in conditions that could be exacerbated by potassium (e.g. heart disease / digitalised patients) and in patients at risk of hyperkalaemia (e.g. extensive tissue damage, Addison's, Rhabdomyolysis, hypoaldosteronism, acute dehydration, severe renal impairment, pancreatitis)
- sodium dihydrogen phosphate in conditions where sodium content may be of a concern or risk of developing significant hypernatraemia (e.g. congestive heart failure, other oedematous states, cirrhosis, eclampsia, aldosteronism)
- urolithiasis e.g. phosphate supplementation in patients with infected magnesium ammonium phosphate stones may exacerbate the condition.

2.3 Phosphate products and availability[1-6]

Supply of **sodium** dihydrogen phosphate and **potassium** dihydrogen phosphate ampoules/vials are governed by the Pharmacy Department of each region and may require presentation of an appropriate medication order prior to supply.

For a list of phosphate products available, see Table 1. Phosphate Products.

Phosphate products	Phosphate content	Potassium content	Sodium content	Clinical preference (to be read with section 2.6)
Sodium phosphate monobasic effervescent tablets (Phosphate Phebra®)	500 mg phosphorus (16.1 mmol) per tablet	123 mg (3.1 mmol) per tablet	469 mg (20.4 mmol) per tablet	Oral replacement is preferred over intravenous when appropriate.
Sodium dihydrogen phosphate **10 mL vial**	10 mmol in 10 mL (1 mmol/mL)	Nil	10 mmol in 10 mL (1 mmol/mL)	**Preferred for intravenous phosphate replacement** unless the patient has concurrent hypokalaemia or in conditions where sodium content is a concern.
Potassium dihydrogen phosphate 10 mmol in 0.9% sodium chloride pre-mixed 250 mL bag	10 mmol in 250 mL (0.04 mmol/mL)	10 mmol in 250 mL (0.04 mmol/mL)	37.5 mmol in 250 mL (0.15 mmol/mL)	For patients with concurrent hypokalaemia or hypernatraemia. Pre-mixed bags preferred to high concentration potassium dihydrogen phosphate product for safety reasons.
*__Potassium dihydrogen phosphate__ **10 mL ampoule/vial**	10 mmol in 10 mL (1 mmol/mL)	10 mmol in 10 mL (1 mmol/mL)	Nil	***RESTRICTED - High concentration potassium product.** See the Potassium Supplementation Procedure for restrictions. For patients with concurrent hypokalaemia or conditions where sodium content is a concern – requiring higher concentrations or a different diluent to the pre-mixed bag (e.g. glucose 5%). Must be diluted before use.

Table 1. Phosphate Products

2.4 Interactions with other medications/fluids

Oral phosphate administration considerations

Concurrent administration of oral phosphate with certain drugs may affect its safety and efficacy. To minimise interactions, oral phosphate doses should be spaced appropriately from these products:

- calcium supplements may increase risk of ectopic calcification
- colecalciferol/calcitriol increases phosphate absorption
- aluminium, calcium or magnesium salts, commonly found in antacids and supplements, may reduce phosphate absorption.

Intravenous (IV) phosphate[3-5] administration considerations

Phosphate solutions (and other electrolytes) are incompatible with blood products, some medicines, fluids containing calcium or magnesium (e.g. Hartmann's, Ringer's). They may also be incompatible with each other.

These solutions should not be administered via Y-site and use separate intravenous line if unsure.

Refer to the AIDH or product information, seek pharmacist advice if required.

2.5 Prescribing, dose, preparation, administration, moniroting[1-22]

Oral supplementation

Oral supplementation is preferred over IV when appropriate as:
- it is safe, effective and more cost effective than IV administration
- intravenous administration can cause hypotension and transient hyperphosphataemia, which may result in serious complications such as hypocalcaemia (tetany), acute kidney injury and arrythmias[7].

Intravenous supplementation

Intravenous supplementation is indicated when **oral replacement is inappropriate** e.g. in patients unable to take, absorb or tolerate oral phosphate replacement and in patients with severe or symptomatic hypophosphataemia. The following should be considered:
- Only senior medical practitioners can prescribe and monitor IV phosphate.
- Doses recommended is dependent on the patient's severity, clinical condition and weight (see Table 2). Adult intake of phosphate is ~35 mmol/day, a reasonable typical IV replacement is 20 – 40 mmol per day[12,15].
- Consider additional supplementation in 24 hours if level is < 0.6 mmol/L[7,14,16].
- Avoid excessive supplementation as hyperphosphataemia can lead to soft tissue metastatic calcification.
- Refer to WACHS Critical Care Medication Administration for Adults Guideline for administration.

Severity Phosphate level[7,10-17]	Recommended Supplementation Route[7,8,10-18]	Dose
Mild 0.6 – 0.8 mmol/L	Supplementation not usually required, unless associated with: • Malnutrition (cancer, alcoholism) • Re-feeding syndrome • Receiving parenteral nutrition • Renal phosphate wasting Recovering from Diabetic Ketoacidosis • Respiratory failure • Severe burns • Clinical signs and symptoms of hypophosphataemia	**Oral:** If indicated, initiate with 30 – 80 mmol/24 hours orally (maximum 100 mmol) in divided doses[5,7,19-23]. For example: • 1 to 2 tablets (500 mg – 1 g) twice daily. (32.2 – 64.4 mmol/24 hours) • Halve dose in renal impairment[7] **Note:** Diarrhoea may be a dose limiting side effect. If oral supplementation is inappropriate, consider IV – follow moderate recommendations.

	If replacement is indicated; oral route is preferred.	
Moderate 0.3 - 0.6 mmol/L	Oral supplementation preferred and is usually sufficient. Consider IV replacement if: • Patient is symptomatic • Oral replacement is inappropriate • Requiring adjunct therapy to oral therapy (e.g. in patients requiring large doses that would not be tolerated orally)	**Oral:** Initiate with 30 – 80 mmol/24 hours orally (maximum 100 mmol) in divided doses[5,7,19-23]. For example: • 2 tablets (1 g) twice or three times daily (64.4 – 96.6 mmol/24 hours) ***IV:** 0.2 mmol/kg/day (round to nearest 10 mmol)[7,9,12,14-16,23]. Typically 10 – 30 mmol phosphate is given in a 24 hour period[12] For example: • 40 – 80 kg = 10 mmol • 81 – 120 kg = 20 mmol • > 120 kg = 30 mmol
Severe < 0.30 mmol/L	Intravenous administration recommended	***IV:** 0.5 mmol/kg/day - up to a maximum of 50 mmol in 24 hours[7,9,12,14-16,23] or 500 micromols/kg in critically ill patients[9] (round to nearest 10 mmol). Typically 20 – 50 mmol phosphate is given in a 24 hour period[12]. For example. • 40 – 50 kg = 20 mmol • 51 – 70 kg = 30 mmol 71 – 90 = 40 mmol > 90 kg = 50 mmol

Table 2: Hypophosphataemia severity, recommended supplementation route and dose

* Higher doses (0.3 – 0.6 mmol/kg/day)[13,18,20-22] may be prescribed in special circumstances e.g. refeeding syndrome, parenteral nutrition, with dietitian support.

Oral Product	Content	Standard prescription/ preparation	Administration and monitoring
Sodium phosphate monobasic effervescent tablet. **(Phosphate Phebra®)**	Each tablet contains phosphorus 500 mg (16.1 mmol phosphate), potassium 123 mg (3.1 mmol) sodium 469 mg (20.4 mmol)	See Table 2 for recommended doses. Adjust doses according to requirements. Dissolve effervescent tablets in a third (80 mL) to half (120 mL) a glass of water.	• Suitable for enteral feeding tubes – see Sodium phosphate - AusDI for details. • Space oral phosphate doses from aluminium, calcium or magnesium salts (contained in common antacids and supplements). • Review serum phosphate levels daily until level normalises unless chronic therapy is indicated.

Table 3: Oral phosphate supplementation

Table 4. Intravenous Phosphate Supplementation

Intravenous products	Content	Standard prescription	Preparation	Administration and monitoring (this column continues over page)	Notes
Sodium dihydrogen phosphate 10 mL ampoule	10 mmol sodium, 10 mmol phosphate	**Peripheral access:** • 10 mmol in 250 mL of compatible fluid (0.04 mmol/mL of phosphate)[4]. • For fluid restricted patients: 10 mmol in at least 100 mL of compatible fluid (0.1 mmol/mL of phosphate) may be considered[4]. **Central access:** • 10 mmol in at least 100 mL of compatible fluid (0.1 mmol/mL of phosphate). • The following **highly concentrated** dilution may only be prescribed by a consultant in ICU/HDU: 40 mmol in 100 mL of compatible fluid (0.4 mmol/mL of phosphate)[14]. **Note:** final concentration of sodium in the above dilutions, will depend on the diluent used.	• Dilute ampoules in compatible fluid e.g. sodium chloride 0.9%, glucose 5% • To avoid toxicity from a large bolus dose, mix the infusion bag/syringe thoroughly by inverting and shaking several times. • Never add phosphate to a hanging bag or to a bag that already contains any additive.	• Infuse 10 mmol over 2 to 6 hours into a large peripheral vein or via central venous catheter[4]. • Longer infusion times are preferred to increase retention and reduce risk of hypocalcaemia and metastatic calcification [4,5,18]. • In critically ill patients with severe hypophosphatemia and normal renal function, the maximum rate of phosphate is 10 mmol/hour for up to 4 hours. Monitor biochemistry as outlined below. Continuous cardiac monitoring is also recommended[4]. • Faster rates may be used in intensive care settings if outlined in guidelines [4,10,11,14]. Rate of potassium must align with limits in the Potassium Supplementation Procedure. Continuous cardiac monitoring for > 10 mmol potassium/hour. • Ensure serum samples have been taken prior to administration (see below). • Consider switching to oral once the phosphate level is > 0.6 mmol/L[7]. • An infusion pump must be used for administration. • Sodium chloride is the preferred diluent when treating concurrent	*Sodium* dihydrogen phosphate is preferred for intravenous phosphate replacement unless the patient has concurrent hypokalaemia or in conditions where sodium content is a concern.
Potassium dihydrogen phosphate in 250 mL sodium chloride 0.9% pre-mixed bag	10 mmol potassium, 10 mmol phosphate	**Peripheral or Central line:** • Potassium 10 mmol with phosphate 10 mmol in 250 mL sodium chloride 0.9% pre-made bag (0.04 mmol/mL of potassium and phosphate).	Pre-mixed bags are not isotonic but can be given via peripheral or central line. Extra potassium must never be added to premixed bags.		For patients with concurrent hypokalaemia or hypernatraemia. Pre-mixed bags preferred to high concentration potassium dihydrogen

Intravenous products	Content	Standard prescription	Preparation	Administration and monitoring (this column continues over page)	Notes
				hypokalaemia, as glucose solutions decrease serum potassium levels. **Monitoring** • Measure the following prior to a phosphate infusion, before any subsequent infusions, and at least every 12 - 24 hours. Note: In critically ill patients receiving 10 mmol/hour of phosphate, monitoring of the below must happen at least hourly i.e after each 10 mmol dose: ○ Sodium or potassium (depending on salt used) ○ Phosphate ○ Magnesium ○ Corrected calcium ○ Renal function • Inspect the infusion site regularly for signs of extravasation. If suspected, follow the S.L.A.P. steps outlined in Appendix 3 of the WACHS Peripheral Intravenous Cannula (PIVC) Guideline. • Monitor for signs and symptoms of electrolyte abnormalities (see adverse effects). If signs/symptoms observed, cease infusion and seek urgent medical review.	phosphate product for safety reasons.
***Potassium dihydrogen phosphate 1.36 g / 10 mL ampoule/vial**	10 mmol potassium and 10 mmol phosphate	***RESTRICTED - High concentration potassium product.** Under exceptional circumstances or in critical care areas the prescription and preparation of a non-standard potassium solution (i.e. not premixed) is permitted after consultation with the **most senior medical practitioner available.** The name of the most senior medical practitioner must be documented on the medication chart order. **Peripheral / Central line:** If premixed bag is not available: • 10 mmol in 250 mL compatible fluid (0.04 mmol/mL of potassium and phosphate)[4]. **Central line only:** Higher concentrations of potassium (> 0.04 mmol/mL) must be administered via central venous line. • 10 mmol in at least 100 mL of compatible fluid (0.1 mmol/mL of potassium and phosphate) • *The following **highly concentrated** solution may only be prescribed by a consultant in ICU/HDU: 40 mmol in 100 mL of compatible fluid (0.4 mmol/mL of potassium and phosphate)[14].	**Supply** • Seek supply from pharmacy or after-hours nurse manager by providing a copy of the medication chart order. • Supply is limited to the exact amount required for the charted dose. • Supply is documented e.g. on a tracking sheet. • Any unused ampoules / vials must be immediately returned. **Preparation** • Dilute with sodium chloride 0.9% when appropriate as it is the preferred diluent (glucose may decrease potassium). • The solution must be fully inverted **at least 10 times** to ensure the potassium is thoroughly mixed. • Potassium must not be added to an infusion bag once it has been hung for administration.		For patients with hypokalaemia or in conditions where sodium content is a concern that require higher concentrations or a different diluent to the pre-mixed bag (e.g. glucose 5%).

2.6 Adverse effects [2-9]

Adverse effects include:

- diarrhoea and gastrointestinal upset is a treatment limiting effect with oral administration
- Hyperphosphataemia, hypocalcaemia, hypomagnesaemia, hyperkalaemia (with potassium salt), hypernatraemia (with sodium salt). Severe signs/symptoms of these electrolytes disturbances include:
  - neuromuscular: tetany (i.e. muscle cramps, spasms and tremors), shortness of breath, muscle weakness and paraesthesia's
  - cardiac: conduction abnormalities, arrythmias, myocardial infarction
  - central nervous system effects: Thirst, fever, confusion, irritability, neuromuscular excitability, hyperreflexia, seizures
- hypotension – higher risk with rapid IV infusion
- peripheral oedema
- extraskeletal calcium deposition (vascular calcification, nephrocalcinosis, renal calculi)
- acute kidney injury (acute phosphate nephropathy with IV administration)
- extravasation injury

3. Roles and Responsibilities

Pharmacists are responsible for providing clinical review of medicines per this guideline.

Pharmacy staff and **after hours nurse managers** are responsible for facilitating supply of high concentration potassium products in accordance with the WACHS Potassium Supplementation Procedure.

Prescribers are responsible for appropriate prescribing, monitoring and review of patients per this guideline.

Nurses/midwives are responsible for appropriate preparation and administration of medicines/therapies and monitoring of patients per this guideline.

All staff are required to comply with the directions in WACHS policies and procedures as per their roles and responsibilities. Guidelines are the recommended course of action for WACHS and staff are expected to use this information to guide practice. If staff are unsure which policies procedures and guidelines apply to their role or scope of practice, and/or are unsure of the application of directions they should consult their manager in the first instance.

4. Monitoring and Evaluation

Adverse events and clinical incidents relating to medications are to be reported via the approved clinical incident management system (CIMS) e.g. DATIX, and managed as per the WACHS Medication Prescribing and Administration Policy and the MP0122/19 Clinical Incident Management Policy. The WACHS Medication Safety Committee and regional Medicines and Therapeutics Committees reviews clinical incident data relevant to medications. CIMS involving phosphate supplementation/management will be used to monitor and evaluate the effectiveness of this guideline.

This guideline will be reviewed as required to determine effectiveness, relevance and currency. At a minimum it will be reviewed every five years by the WACHS Medication Safety Committee.

Guidelines are designed to provide staff with evidence-based recommendations to support appropriate actions in specific settings and circumstances. As such, WACHS guidelines should be followed in the first instance. In the clinical context, where a patient's management should vary from an endorsed WACHS guideline, this variation and the clinical opinion as to reasons for variation must be documented in accordance with the Documentation Clinical Practice Standard.

5. References

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6. Definitions

Term	Definition
Senior Medical Practitioner	Medical officer practising at a level of registrar, general practitioner (GP) (for district sites) or higher.
Prescribers	Health professionals authorised and competent to complete a medication order for administration.
Critical care areas	High-acuity areas providing advanced medical care, such as Emergency Departments, High-Dependency Areas/Units, Intensive Care Units, Operating Theatres, and Post-Anaesthetic Care Units

7. Document Summary

Coverage	WACHS-wide
Audience	Nurses and Midwives, Medical Practitioners and Pharmacists who prescribe, administer and manage adult patients receiving IV Phosphate Supplementation
Records Management	Clinical: Health Record Management Policy
Related Legislation	*Health Services Act 2016* *Medicines and Poisons Act 2014* *Medicines and Poisons Regulations 2016*
Related Mandatory Policies / Frameworks	• MP 0131/20 High Risk Medication Policy • Clinical Governance, Safety and Quality Policy Framework • Public Health Policy Framework
Related WACHS Policy Documents	• Clinical Documentation Policy • High Risk Medication Procedure • Medication Prescribing and Administration Policy • Potassium Supplementation Procedure
Other Related Documents	Nil
Related Forms	• MR176 WACHS Intravenous Fluid Treatment • MR176P WACHS Neonatal / Paediatric Intravenous Fluid Treatment
Related Training	Available from MyLearning: • High Risk Medications: Introduction (HRMINT EL2)
Aboriginal Health Impact Statement Declaration (ISD)	ISD Record ID: 4265
National Safety and Quality Health Service (NSQHS) Standards	1.27, 1.28, 4.01, 4.13, 4.14, 4.15
Aged Care Quality Standards	Nil
Chief Psychiatrist's Standards for Clinical Care	Nil
Other Standards	Nil

8. Document Control

Version	Published date	Current from	Summary of changes
4.00	22 December 2022	22 December 2022	Desktop Review, new template, Change of brand for oral dosage, and broader recommendation for dosing in accordance with references.
5.00	27 November 2025	27 November 2025	• change of title • addition of tables • Roles and Responsibilities more clearly defined.

9. Approval

Policy Owner	Executive Director Clinical Excellence
Co-approver	Executive Director Nursing and Midwifery
Contact	WACHS Chief Pharmacist
Business Unit	Pharmacy
EDRMS #	ED-CO-13-12205

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