Ballarat Health Services

DRUG GUIDELINE

PHOSPHATE

HIGH RISK MEDICATION

SCOPE (Area): **FOR USE IN:** Intensive Care Unit, ED, Coronary Care Unit, Theatre and General Wards
EXCLUSIONS: Paediatrics (seek Paediatrician advice)
SCOPE (Staff): Medical, Nursing and Pharmacy

Note: Ballarat Health Services stocks the following two intravenous phosphate containing products. Other salts are not available at BHS.

Sodium dihydrogen phosphate (referred to as sodium phosphate in this guideline)
10 mmol phosphate and 10 mmol sodium per 10 mL
For phosphate supplementation as described in this guideline.

Potassium dihydrogen phosphate and dipotassium hydrogen phosphate
14.5 mmol phosphate and 25 mmol potassium per 10 mL
Not used for phosphate supplementation (due to very high potassium content it is reserved for the treatment of hypokalaemia complicated by hyperchloraemia where potassium chloride administration is not appropriate – see Potassium DRG0043 and DRG0044).

BRAND NAMES
Nil.

PHARMACOLOGY AND PHARMACOKINETICS
Phosphate has an essential role in bone structure and is also important in many metabolic and enzymatic pathways. 80% of phosphate in the body is present as calcium phosphate, giving rigidity to the bone. The remainder is involved with energy storage and transfer, utilisation of B complex vitamins, buffering of body fluids and renal excretion of hydrogen ions. Phosphate is primarily excreted in the urine. Serum phosphate levels are inversely related to serum calcium levels and to renal metabolism of vitamin D.

INDICATIONS
- Treatment of moderate and severe hypophosphataemia – see Dosage and Administration.

CONTRAINDICATIONS
- **Hyperphosphataemia.**
- **Hypocalcaemia** – due to the close link between hypocalcaemia and hyperphosphataemia.
- **Hypernatraemia -** sodium contained in injection may exacerbate hypernatraemia.
- **Urolithiasis** – may exacerbate infected magnesium ammonium phosphate urolithiasis.

PRECAUTIONS

- **Conditions where hypernatraemia may occur (including drugs that contain or increase sodium)** – use with caution due to the sodium content of the ampoules.
- **Conditions where sodium content may be a concern** – use with caution in heart failure, oedematous states, cirrhosis, eclampsia, aldosteronism.
- **Conditions where high phosphate levels may occur (including drugs that contain phosphate)** - e.g. hypoparathyroidism, chronic renal disease and rhabdomyolysis, acute dehydration, pancreatitis, extensive tissue damage (such as severe burns).
- **Conditions where low calcium levels may occur** - e.g. hypoparathyroidism, osteomalacia, chronic renal disease, acute pancreatitis, rhabdomyolysis and rickets.

PREGNANCY AND BREASTFEEDING

Seek specialist advice before prescribing, information may update regularly.

DRUG INTERACTIONS

- **Calcium containing medications** - may increase risk of deposition of calcium in soft tissues.
- **Salicylates** – can increase concentration of salicylates as excretion of salicylate is decreased in urine acidified by phosphate.
- **See Precautions re drugs effecting sodium or phosphate.**

DOSAGE AND ADMINISTRATION

Extravasation may cause tissue necrosis, administer by CVC or large peripheral vein only.

Note: some references state to reduce dose in renal impairment, or that phosphate is contraindicated in severe renal impairment. The Renal Drug Database states no dose reduction is required. End Stage Renal failure patients usually have high phosphate and do not require supplementation.

Always dilute ampoules as outlined below before use, and mix the bag well by inverting and shaking to avoid inadvertently administering a more concentrated dose.

Each ampoule contains 10 mmol phosphate and 10 mmol sodium in 10 mL.

Prescribe order in mmol:
"Sodium Phosphate 10 mmol", together with appropriate dilution and rate information on the Intravenous Orders chart (MR/645.0).

Rapid complete correction of severe abnormality can be dangerous, partial correction is generally the best immediate option.

Moderate hypophosphataemia (asymptomatic)
Serum phosphate 0.5-0.8 mmol/L.

Enteral administration (should be used in preference to IV administration where possible)
Phosphate (Phosphate-Sandoz®) 500 mg effervescent tablets, 500-1000 mg enterally tds dissolved in half a glass of water. Dose selected depends on degree of hypophosphataemia and may be limited by diarrhoea.

Enteral phosphate needs to be spaced 2 hours from antacids, iron, calcium, magnesium, sucralfate and 4 hours from colestipol (all of which can decrease phosphate absorption). Vitamin D preparations (cholecalciferol and calcitriol) can increase phosphate absorption leading to hyperphosphataemia. If administering via enteral feeding tube, disperse the dose in water until bubbles have settled, and then draw up in an enteral syringe.

Each tablet contains phosphate 16.1 mmol, potassium 3.1 mmol and sodium 20.4 mmol. This amount of potassium and sodium should be taken into account where clinically relevant. Approximately two thirds of the phosphate dose (about 10.7 mmol per tablet) is absorbed enterally (mostly from the jejunum and duodenum).

IV administration
May be required where enteral administration is impractical.

****Guardrails name in Alaris pump is 'Sodium phosphate'****

GENERAL WARDS and CORONARY CARE UNIT
Via large peripheral vein or CVC (including PICC):
Sodium Phosphate 10 mmol (10 mL from ONE ampoule of sodium phosphate) added to 250 mL sodium chloride 0.9%, given by IV infusion over 2 hours.
Total volume: 260 mL.
Rate of infusion: 130 mL/hr.

INTENSIVE CARE UNIT, ED, THEATRE, CVS
Via CVC:
In Guardrails select therapy '.Standard CVC'
Sodium Phosphate 10 mmol (10 mL from ONE ampoule of sodium phosphate) added to a 100 mL minibag of sodium chloride 0.9%, given by IV infusion over 2 hours.
Total volume: 110 mL
Rate of infusion: 55 mL/hr.

Via large peripheral vein:
In Guardrails select therapy '.Standard Peripheral'
Sodium Phosphate 10 mmol (10 mL from ONE ampoule of sodium phosphate) added to 250 mL sodium chloride 0.9%, given by IV infusion over 2 hours.
Total volume: 260 mL.
Rate of infusion: 130 mL/hr.

Severe or symptomatic hypophosphataemia

Serum phosphate less than 0.5 mmol/L.

Signs and symptoms can include anorexia, muscle weakness, rhabdomyolysis, osteomalacia, haemolytic anaemia, impaired leukocyte and platelet function, paralysis, confusion, left ventricular dysfunction, heart failure, arrhythmias, respiratory failure, progressive encephalopathy, seizures, coma and death.

****Guardrails name in Alaris pump is 'Sodium phosphate'****

GENERAL WARDS and CORONARY CARE UNIT

Commence infusion (as above for moderate hypophosphataemia on General Wards) as soon as is practicable, and if clinically warranted Home Team to discuss management and possible transfer to Intensive Care Unit with Intensive Care Unit Medical Staff

INTENSIVE CARE UNIT, ED, THEATRE, CVS

Via CVC:

In Guardrails select therapy '.Symptomatic CVC'

Requires ECG Monitoring

Sodium Phosphate 10 mmol (10 mL from ONE ampoule of sodium phosphate) added to a 100 mL minibag of sodium chloride 0.9%, given by IV infusion over 1 hour.

Total volume: 110 mL.

Rate of infusion: 110 mL/hr.

If prescribing more than two bags of 10 mmol, discuss with Registrar if a phosphate level is required after the second bag.

Fluid restricted ICU patients via CVC only:

In Guardrails select therapy 'ICU CVC fluid restri'

Requires ECG Monitoring

See DRG0048: Antibiotic and Electrolyte volumes for fluid restricted ICU patients (via CVC only).

Via large peripheral vein:

In Guardrails select therapy '.Symptomatic Periph'

Requires ECG Monitoring

Sodium Phosphate 10 mmol (10 mL from ONE ampoule of sodium phosphate) added to a 250 mL bag of sodium chloride 0.9%, given by IV infusion over 2 hours.

Total volume: 260 mL

Rate of infusion: 130 mL/hr.

Consider a CVC if more rapid administration is required.

If prescribing more than two bags of 10 mmol, discuss with Registrar if a phosphate level is required after the second bag.

If still symptomatic post dose seek Medical advice immediately. Repeat blood tests (see Monitoring) and/or dose if clinically indicated.

General Administration Information

- **Infusion preparation:**
  Mix infusion thoroughly (by inverting and shaking) after adding phosphate to avoid inadvertently giving a more concentrated dose.

Other compatible infusion fluid may be substituted where deemed necessary by the Medical Officer.
Infusion stability – no information is available, use as soon as practicable.

- **Infusion pump:** Alaris® LVP (or syringe unit with ICU CVC fluid restricted) with Guardrails®
- **Routes of administration:**
  IV injection: No
  IV intermittent infusion (15-60 minutes): Yes (only as above over 60 mins)
  IV continuous infusion (longer than 60 mins): Yes
  IM injection: No
  Subcut injection: No
- **Compatible/incompatible IV drugs/fluids:**
  Note: Incompatible with magnesium and calcium.
  Consult the Australian Injectable Drugs Handbook ('Yellow book') in your ward area. **Assume all unlisted drugs and IV fluids are incompatible – contact Pharmacy for further advice.**

MONITORING (INCLUDING BLOOD TESTS)

- Serum sodium, phosphate, magnesium, calcium and renal function should be monitored at baseline and post IV dose (if patient still symptomatic seek Medical advice immediately, or if asymptomatic at 6-12 hours).
- Monitor for any signs of tetany. A rapid increase in phosphate levels can lead to a sudden decrease in calcium levels resulting in tetany. If tetany occurs cease infusion, seek medical assistance, take blood (for serum sodium, potassium, phosphate, calcium, magnesium and renal function) and commence an ECG.
- Avoid excessive supplementation as hyperphosphataemia can lead to soft tissue calcification, including of the eye, lung, heart and kidney.
- As well as hypocalcaemia and hyperphosphataemia, monitor for hypernatraemia, and hypomagnesaemia.

NURSING PRACTICE POINTS

- Report any signs of tetany (involuntary muscle contraction) to Medical Officer and cease infusion. See Monitoring.
- Ensure patency of IV access prior to commencement of infusion, and monitor IV site for phlebitis. If patient complains of severe pain or burning of injection site or limb, cease infusion and contact Medical Officer. **Extravasation can cause tissue necrosis –see Dosage and Administration.**
- Rapid infusion can lead to hypotension and dysrhythmia. Monitor heart rate, respiratory rate and blood pressure when phosphate is infused at a rate faster than 10 mmol over 2 hours.
- Blood tests as ordered by the Medical Officer – see Monitoring.
- Discard any solution that is discoloured, hazy or contains visible particulates.
- All injections, infusions and lines are to be labelled as per CPP0022 Labelling of Injectable Medicines and Lines.

ADVERSE EFFECTS

- **Extravasation** – may cause tissue necrosis.
- **Uncommon –** hypotension, fluid retention (swelling feet/lower limbs, weight gain), hypernatraemia (confusion, tiredness, weakness, convulsions, oliguria, tachycardia, headache, dizziness, increased thirst). Hyperphosphataemia, hypocalcaemia or hypomagnesaemia can lead to convulsions, muscle cramps, tetany, numbness, tingling, pain or weakness in hands or feet, shortness of breath, tremor.
- **Rare –** acute renal failure, myocardial infarction.

DRUG PRESENTATIONS AND STORAGE

Sodium dihydrogen phosphate dihydrate 1.56 g in 10 mL ampoules.
Contains 10 mmol phosphate and 10 mmol sodium per 10 mL ampoule.
Store below 25°C.