

How is acute hypophosphataemia treated in adults?

Prepared by UK Medicines Information ([UKMi](http://www.ukmi.nhs.uk)) pharmacists for NHS healthcare professionals
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Background

There are no national guidelines for the treatment of acute hypophosphataemia and practice varies widely across hospital Trusts. Following a thorough search of the literature this guidance has been prepared and adopted in Leeds Teaching Hospitals NHS Trust (LTHT). The use of phosphate for other indications such as re-feeding syndrome or use in the critical care setting has not been considered.

Reference ranges for serum phosphate vary between laboratories. For the purpose of this document, the reference range used for phosphate is 0.8 - 1.5 mmol/L.

Phosphate deficiency can be caused by (1-4)

- redistribution of phosphate into cells (e.g. respiratory alkalosis, drug therapy (insulin, catecholamines))
- increased urinary excretion (e.g. metabolic or respiratory acidosis, hyperparathyroidism)
- decreased intestinal absorption (e.g. antacid abuse, vitamin D deficiency, chronic diarrhoea)

Symptomatic hypophosphataemia is usually observed when plasma phosphate falls below 0.3 mmol/L (1,3). Symptoms may include (1-4):

- myopathy, rhabdomyolysis, weakness
- respiratory failure
- arrhythmias, cardiomyopathy
- irritability, confusion, hallucinations, somnolence, convulsions, coma

Answer

At LTHT phosphate replacement is prescribed for patients with severe hypophosphataemia (serum phosphate concentration < 0.3mmol/L). For patients with moderate hypophosphataemia (serum phosphate concentration 0.3 - 0.6 mmol/L), phosphate replacement can be considered if the patient is symptomatic or following consideration of the clinical risks and benefits (6). Although this document offers guidance, the dose of phosphate to correct hypophosphataemia should be determined on an individual patient basis.

Phosphate is renally excreted and should be used with caution in patients with severe renal impairment (5). Phosphate should be used with caution in patients who have low serum calcium concentrations as these may decrease further when phosphate is replaced (3-5).

Oral phosphate replacement

- In the UK a licensed oral phosphate preparation is Phosphate Sandoz® effervescent tablets (7). Each tablet contains phosphate 16.1mmol, sodium 20.4mmol and potassium 3.1mmol (8). A common dose is 1 - 2 tablets three times a day (6). The dose should be reviewed daily and adjusted according to phosphate levels (6).
- Oral phosphate supplements should not be taken with aluminium, calcium or magnesium salts as these will bind phosphate and reduce its absorption (5).

Parenteral phosphate replacement

- Intravenous therapy is indicated if the patient has severe hypophosphataemia or is symptomatic. Intravenous therapy may also be considered for patients who are unlikely to absorb oral agents (6).
- Phosphates Polyfusor® may be a suitable intravenous product. Each 500ml Phosphates Polyfusor® contains phosphate 50mmol, potassium 9.5mmol and sodium 81mmol (4). Alternative intravenous phosphate preparations are available, however their use may be limited to intensive care wards due to their high potassium content (6).
- Doses for intravenous phosphate vary in the literature and suggested regimens have included 0.2 - 0.5mmol/kg/day up to a maximum of 50mmol (4,5,8).
- Table 3 gives some suggested doses of Phosphates Polyfusor® based on weight for patients with normal renal function. Reduced doses may be necessary in patients with impaired renal function (4).

Table 3: Suggested doses of Phosphates Polyfusor® adapted from Taylor et al. (9).

| Serum phosphate concentration | Weight 40 - 60kg | | Weight 61 - 80kg | | Weight 81 - 120kg | |
|--------------------------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| | Amount of phosphate | Volume of polyfusor | Amount of phosphate | Volume of polyfusor | Amount of phosphate | Volume of polyfusor |
| < 0.3mmol/L | 25 mmol | 250 mL | 35 mmol | 350 mL | 50 mmol | 500 mL |
| 0.3 - 0.6 mmol/L (if oral route not suitable) | 10 mmol | 100 mL | 15 mmol | 150 mL | 20 mmol | 200 mL |

Summary

- There is no national guidance on the treatment of hypophosphataemia and practice varies widely across hospital Trusts. The guidance in this document reflects practice at Leeds Teaching Hospitals NHS Trust.
- Phosphate replacement should be prescribed for patients with severe hypophosphataemia (serum phosphate concentration < 0.3 mmol/L). For patients with moderate hypophosphataemia (serum phosphate concentration 0.3 - 0.6 mmol/L), phosphate replacement should be considered if the patient is symptomatic or following a consideration of the clinical risks and benefits.
- In moderate hypophosphataemia where the patient is asymptomatic, oral phosphate therapy should be considered if dietary modification is unsuitable. A dose of Phosphate Sandoz® effervescent tablets for hypophosphataemia is 1-2 tablets three times daily. The dose should be reviewed daily and adjusted according to phosphate levels.
- In severe hypophosphataemia, in symptomatic patients and when the oral route is not appropriate, intravenous phosphate therapy may be considered. Doses for intravenous phosphate vary in the literature and suggested regimens have included 0.2-0.5mmol/kg/day

up to a maximum of 50mmol (see Table 3) however local practices may vary. Phosphates Polyfusor® is a commonly used product for this indication.

- The required dose from a Phosphates Polyfusor® is usually given over 12 - 24 hours but can be given over 6 - 12 hours.
- Phosphate is renally cleared. Phosphate (especially via the intravenous route) should be used with caution in patients with renal impairment.
- Phosphates Polyfusors® should be administered with caution to patients with cardiac failure, peripheral or pulmonary oedema, impaired renal function or conditions predisposing to hyperkalaemia due to the potassium and sodium content of Phosphates Polyfusors®.
- Patients with hypocalcaemia should have their calcium corrected before replacing phosphate to prevent further [hypocalcaemia](#).

Limitations

This Q&A is designed for adult patients only. This guidance is not suitable for chronic hypophosphataemia, patients with complex medical problems, or those with renal impairment or re-feeding syndrome. The dose of phosphate to correct hypophosphataemia should be determined on an individual patient basis. There are no national guidelines for the treatment of hypophosphataemia, and practice varies widely across hospital Trusts.

References

1. Weisinger JR and Bellorin-Font E. Electrolyte quintet: Magnesium and phosphorus. *The Lancet* 1998; 352: 391-352
2. Subramanian RMB, Khardori BS, Romesh MD. Severe Hypophosphataemia: Pathophysiologic Implications, Clinical Presentations and Treatment. *Medicine* 2000; 79(1): 1-8
3. Hicks W and Hardy G. Phosphate supplementation for hypophosphataemia and parenteral nutrition. *Current Opinion in Clinical Nutrition and Metabolic Care* 2001; 4: 227-233
4. Summary of Product Characteristics. Phosphates Polyfusor®. Fresenius Kabi. Date of revision of text November 2014
5. Brayfield, A. Martindale. *The Complete Drug Reference*, online edition. London: Pharmaceutical Press. Accessed via www.medicinescomplete.com (20/07/2017)
6. Leeds Teaching Hospitals NHS Trust. Clinical guideline of the treatment of hypophosphataemia in adults. In-house document. Review date 08/12/2014
7. Summary of Product Characteristics. Phosphate Sandoz tablets. HK Pharma Limited. Date of revision of text October 2015. Accessed via www.medicines.org.uk (20/07/17)
8. Baxter, K. *British National Formulary* (online). London: BMJ Group and Pharmaceutical Press. Accessed via www.medicinescomplete.com (20/07/2017)
9. Taylor BE, Huey WY, Buchman TG, Boyle WA and Coppersmith CM. Treatment of Hypophosphataemia Using a Protocol Based on Patient Weight and Serum Phosphate Level in a Surgical Intensive Care Unit. *Journal of the American College of Surgeons* 2004; 198(2): 198-204

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Search strategy

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