A312 –To identify the incidence, severity and timing of hypophosphataemia in Glasgow Royal Infirmary Intensive Care Unit (ICU)

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Background

Hypophosphataemia is a common treatable problem in the Intensive Care Unit (ICU), and can be indicative of many pathophysiological processes. The treatment and presentation of critical illness in ICU potentially causes acute change in serum phosphate concentration eg: insulin, steroids, re-feeding, diuretics, catecholamines, altering acid base balance.

Aims

The aim of this audit was to quantify the incidence, severity and timing of hypophosphataemia in Glasgow Royal Infirmary Intensive Care Unit. Namely the incidence of hypophosphataemia on admission to ICU and the incidence of hypophosphataemia that develops following admission.

Methods

A retrospective audit of data entered in computerised medical record database (CareVue) from of all admissions between 27/04/2006 (when the electronic record was initiated) and 07/07/2008. The time, date and value of all serum phosphate concentrations were collated. The phosphate concentrations of all patients were then analysed by day of sampling and day after admission. Abnormal phosphate concentrations in mmol/l were subsequently categorised as the following: critically low (< 0.3), low (<0.7), high (>1.5).

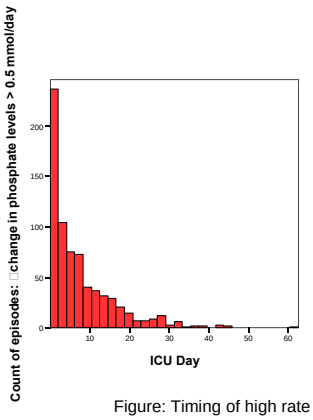
Results

689 of 795 patients admitted during this period had a serum phosphate recorded. The table below shows that the incidence of hypophosphataemia on admission to GRI ICU is 10% of which less than 1% is at a critical concentration. However, the incidence of hypophosphataemia during the whole of the ICU stay rises to 42% of admissions. 5% of all admissions to ICU will develop critical hypophosphataemia at some point during their ICU stay.

69% of patients who have critically low hypophosphataemia in ICU have a normal or high concentration of phosphate on admission, 19% have a low admission phosphate and 13% are admitted with a critically low phosphate concentration.

Phosphate Level	Admission N (%)	Minimum (at any time) N (%)
All	689	689
Critically low	4 (0.4%)	32 (5%)
Low	69 (10%)	289 (42%)
Normal	364 (53%)	311 (45%)
High	256 (37%)	89 (13%)

Results



319/795 (40%) admissions had a rate of change of phosphate of more than 0.5mmol/day

i.e. dpdt > 5.787×10^{-6}

There were 717 episodes in which dp/dt was greater than 0.5 mmol/day

On any one day a mean of 9% of admissions had a rate of change of phosphate of more than 0.5mmol/day (range 0-20%)

Figure: Timing of high rate of change of serum phosphate concentrations (day after ICU admission)

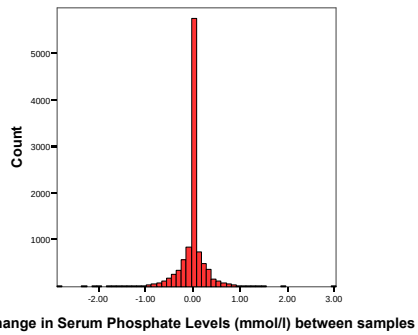


Figure: Frequency of changes in serum phosphate concentration

The graphs above show that distribution of the rates of change of serum phosphate concentration, and the timing of maximum change. The greatest rates of change occur in the early days, when there are most patients in the ICU however there are still episodes that occur late in ICU stay. There is approximately a 9% incidence of high rate of change of phosphate on any one day of ICU admission.

Conclusion

Hypophosphatemia is common in ICU admissions. Most commonly it develops subsequent to admission to ICU and reaches critical levels in 5% of ICU admissions. High rates of change of serum phosphate may occur at any time during the ICU admission. If the phosphate changes were primarily due to re-feeding syndrome, it could be anticipated that these would occur disproportionately on the early days of ICU admission. Although there is a numerically higher number of patients with high rate of serum phosphate change in the initial days of ICU admission, the proportion of patients who develop high rates of change of phosphate remains relatively consistent at 9% on any one ICU day. Some of the changes are extreme. The timing of these high rates of change in serum phosphate concentration may indicate specific pathophysiological processes and merits further investigation.

References
1. Fraser, WD et al.: Clinical Endocrinology 1994; 40: 523-528