Investigating risk factors associated with hyponatraemia in hospitalised patients using an electronic prescribing system with health records

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Hyponatraemia, defined as a serum sodium concentration of <135mmol/l, is the most commonly encountered electrolyte disturbance in hospital patients. Various studies have shown that hyponatraemia occurs in up to 30% of hospitalised patients. Hyponatraemia has been associated with older age, low body weight, chronic diseases and diuretic therapy to name but a few.

This study set out to identify risk factors for hyponatraemia in a large dataset of patients in a UK teaching hospital and to ascertain patient outcomes.

Methodology

A retrospective case-control study design was used to explore risk factors associated with hyponatraemia. Hospital episode data were extracted from an electronic prescribing system with health records used in an English teaching hospital. We used serum sodium levels measured in adult patients admitted over a one year period (2010-2011) to group patients. A patient was classed as hyponatraemic if their lowest serum sodium result during their in-patient spell was <135mmol/l and classed as non- hyponatraemic if serum sodium was ≥135mmol/l (controls).

Statistical tests for categorical and non-parametric data were used to examine the null hypothesis that there was no difference in risk factors and outcomes between hyponatraemic and non-hyponatraemic patients. A multivariate logistic regression model of risk factors associated with hyponatraemia was fitted.

Results

Data from 22,306 patients were analysed and 19% were classified as hyponatraemic during their in-patient spell. The risk of hyponatraemia was greater with increasing age - especially in those aged 60-69 (adjusted OR 2.2; 95% C.I. 1.6-2.9; p<0.001). The risk of hyponatraemia was also found to be greater for patients who were underweight (unadjusted OR 1.4; 1.1-1.7; p<0.001). Patients with Stage 5 renal failure were found to have a three-fold increased risk of hyponatraemia compared to those with less severe renal failure (adjusted OR 2.5; 1.9-3.2; p<0.001). Those patients with a higher Charlson Comorbidity Index (≥13) were more likely to have hyponatraemia (adjusted OR 1.3; 1.1-1.6; p<0.05).

More hyponatraemic patients were prescribed diuretics compared to non-hyponatraemic patients (thiazides 10.4% vs. 5.1%, loop 6.9% vs. 4.9% and potassium sparing 1.9% vs. 1%, all p<0.001), when entered into the multivariate logistic regression model, thiazide diuretic administration was associated with an increased risk of developing hyponatraemia (adjusted OR 1.7; 95% C.I. 1.3-2.1; p<0.001). Patients who were on NSAIDs and SSRIs were less likely to have hyponatraemia (adjusted OR 0.5; 95% 0.3-0.6 and adjusted OR 0.2; 0.1-0.8; p<0.05 respectively). Increasing severity of hyponatraemia was found to have a higher incidence of all-cause mortality (20% vs. 3%, p<0.001).

Conclusions

This study demonstrated that approximately 1 in 5 patients experienced hyponatraemia during their admission in this hospital and were more likely to have poorer outcomes than non-hyponatraemics. We concluded that this is a relatively convenient form of data extraction and the results can be used to better understand the risk factors associated with hyponatraemia. Some associations, such as diuretics, have a direct causal relationship and in some cases hyponatraemia may be a marker of increasing comorbidity. The next steps would be to use these results (incorporating them into algorithms) to alert health care professionals and guide them whilst they use electronic prescribing systems, thereby ensuring that patients receive the most appropriate care and management whilst in hospital.