this audit was therefore to assess whether the implementation of the blood investigation order chart reduced the number of blood tests performed and the associated costs.

Methods Data on the numbers and types of blood investigations were collated for all patients with a length of stay greater than 24 hours in our six-bed critical care unit. The audit period covered 100 days prior to implementation of the order chart and 100 days post implementation. The blood tests assessed were; full blood picture (FBP), urea and electrolytes (U&E), coagulation screen, liver function tests (LFT), magnesium, bone profile (Ca, PO_4 and albumin), and C-reactive protein (CRP). A comparative analysis of the numbers, types and costs of blood testing pre and post implementation was conducted. The study did not seek to assess patient outcomes mainly due to the small number of patients involved.

Results The implementation of the ordering chart resulted in a reduction in the number of blood investigations ordered, from a total of 2,209 pre implementation to 1,477 post implementation; that is, a 33% net reduction. The tests that showed the largest reductions were coagulation screens, LFT and bone profiles, with reductions of 52%, 54% and 53%, respectively. A moderate reduction was observed in magnesium and CRP tests, at 43% and 21% respectively. Only a very small reduction in the number of FBP and U&E tests was found. When the financial costs of these reductions are assessed, the analysis showed an overall saving for the ICU of £17,914 per annum, or £2,986 per bed.

Conclusions The results of this audit suggests that the implementation of simple low-cost measures, such as a blood investigation order chart to specify and customise blood testing in the ICU, can significantly reduce the costs associated with patient stay in the ICU.

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P134

Contribution of red blood cells to the compensation for hypocapnic alkalosis through plasmatic strong ion difference variations

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Introduction Chloride shift is the movement of chloride between red blood cells (RBC) and plasma (and *vice versa*) caused by variations in pCO_2. The aim of our study was to investigate changes in plasmatic strong ion difference (SID) during acute variations in pCO_2 and their possible role in the compensation for hypocapnic alkalosis.

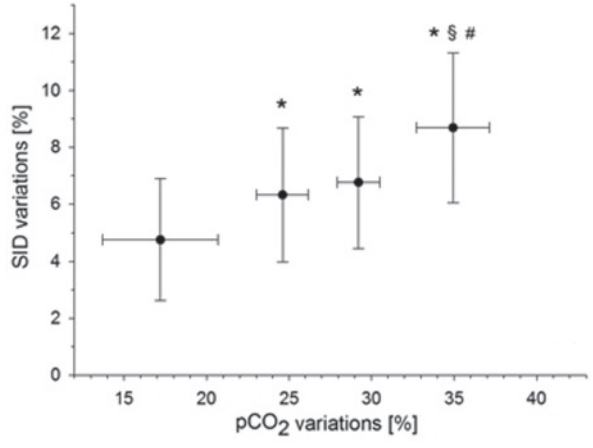

Figure 1 (abstract P134). *P <0.05 versus first quartile. §P <0.05 versus second. #P <0.05 versus third. One-way ANOVA.

Methods Patients admitted in this year to our ICU requiring extracorporeal CO_2 removal were enrolled. Couples of measurements of gases and electrolytes on blood entering (v) and leaving (a) the respiratory membrane were analyzed. SID was calculated as $[Na^+] + [K^+] + 2[Ca^{2+}] - [Cl^-] - [Lac^-]$. Percentage variations in SID (SID%) were calculated as $(SID_v - SID_a) \times 100 / SID_v$. The same calculation was performed for pCO_2 (pCO_2%). Comparison between v and a values was performed by paired *t* test or the signed-rank test, as appropriate.

Results Analysis was conducted on 205 sample-couples of six enrolled patients. A significant difference (P <0.001) between mean values of v–a samples was observed for pH (7.41 ± 0.05 vs. 7.51 ± 0.06), pCO_2 (48 ± 6 vs. 35 ± 7 mmHg), $[Na^+]$ (136.3 ± 4.0 vs. 135.2 ± 4.0 mEq/l), $[Cl^-]$ (101.5 ± 5.3 vs. 102.8 ± 5.2 mEq/l) and therefore SID (39.5 ± 4.0 vs. 36.9 ± 4.1 mEq/l). pCO_2% and SID% significantly correlated (r^2 = 0.28, P <0.001). Graphical representation by quartiles of pCO_2% is shown in Figure 1.

Conclusions As a reduction in SID decreases pH, the observed movement of anions and cations probably limited the alkalinization caused by hypocapnia. In this model, the only source of electrolytes are blood cells (that is, no interstitium and no influence of the kidney is present); it is therefore conceivable to consider the observed phenomenon as the contribution of RBC for the compensation of acute hypocapnic alkalosis.

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Interactive visual analysis of a large ICU database: a novel approach to data analysis

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Introduction ICUs generate vast amounts of valuable data. The size and complexity of the data make analysis technically demanding and time-consuming. We used interactive visual analysis (IVA) to analyse a large ICU database using the association between sodium and mortality as a case study.

Methods We analysed routinely collected longitudinal clinical ICU data using ComVis©, an IVA tool developed for research in nonmedical fields. Coordinated multiple views enable the simultaneous visualisation of multiple variables of any data type (including time series). Individual variables and relationships between multiple variables are displayed in multiple linked views using user-selected box plots, histograms, scatter-plots, time series, parallel coordinates, and so forth. Visually selecting data by brushing with the cursor simultaneously highlights corresponding data in all other views. Multiple brushes are combined using Boolean logic, and the new selection is automatically updated across all views. We used IVA to analyse the univariate effect of sodium (Na) longitudinal trends (and rate of change) on mortality in 1,447 ICU patients. We defined high sodium as >150 mmol/l, low Na as <130 mmol/l, and a rapid rise and fall as a change >3 mmol/l/hour at any time. Trends of interest were identified using IVA while OR and P values were calculated using standard statistical techniques.

Results Overall ICU mortality was 22.5% (95% CI = 0.20.3 to 24.7%). Mean Na was 140 mmol/l (SD 4.3, within-patient minimum and maximum 123 and 166). Mortality was associated with: high Na versus Na <150 (28.6% vs. 20.9%, OR = 1.5, P = 0.004); rapid Na fall versus no rapid fall (27.6% vs. 17.7%, OR = 1.8, P <0.001); and rapid Na rise versus no rapid rise (27.6% vs. 17.7%, OR = 1.8, P <0.001). In contrast, low Na versus Na >130 (24.8% vs. 21.9%, OR = 1.2, P = 0.3), low Na with a rapid rise versus low Na with no rapid rise (26.3% vs. 20.7%, OR = 1.4, P = 0.3) and high Na with a rapid fall versus high Na with no rapid fall (30.6% vs. 24.2%, OR = 1.4, P = 0.3) were not associated with mortality.

Conclusions IVA facilitates a visual approach to data analysis that is both intuitive and efficient. This hypothesis can first be explored visually before further analysis using conventional statistical methods. Advanced statistical modeling can be used to confirm any potential hypothesis identified by visual analyses.