

## AIM

1. Has the introduction of pre-hospital Calcium Chloride reduced the incidence of hypocalcaemia noted in patients receiving a pre-hospital transfusion?
2. Is Kent Surrey Sussex Air Ambulance Trust (AAKSS) following its Standard Operating Procedure (SOP)?

## INTRODUCTION

- Haemorrhage is one of the leading reversible causes of mortality from traumatic injuries in the pre-hospital setting<sup>(1)</sup>.
- Hypocalcaemia results from packed red blood cell (PRBC) transfusion due to citrate (3g) present binding readily to free ionised calcium ( $iCa^{2+}$ ), reducing the amount available in circulation<sup>(2)</sup>.
- $iCa^{2+}$  deficiency may predispose major trauma patients to cardiac myopathy, worsening of coagulopathy and nerve dysfunction.
- Recognised treatment level of hypocalcaemia is  $\leq 1.00$  mmol/L<sup>(3)(4)</sup>. Common intervention is intravenous (IV) calcium chloride ( $CaCl_2$ ).
- Current SOP (post 11th July 2017);  $CaCl_2$  (10%, 10ml) to be given through a 2nd IV line, immediately after 2 PRBC units for any Code Red (major transfusion) patient<sup>(5)</sup>.

## METHODS

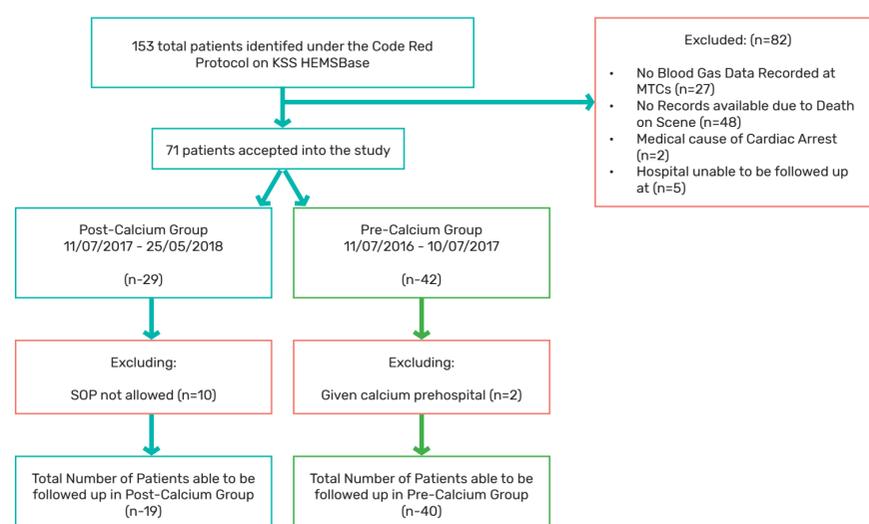
- Observational retrospective cohort study
- Code Red patients with suspected traumatic haemorrhage were identified from 11th July 2016 to 25th May 2018, separated into two groups, with the introduction of SOP (11th July 2017) as the cut-off.
- Comparing  $iCa^{2+}$  on admission to hospital between the Pre-Calcium (prior to 11th July 2017) with the Post-Calcium group (post 11th July 2017)
- Initial Ionised Calcium ( $iCa^{2+}$ ) results, number of PRBC units given and other baseline demographics were collected (figure 1).
- KSS HEMSbase, the Trauma Audit and Research Network (TARN) and databases from three Major Trauma Centres in South-East England used.

## FIGURE 1 – Table of baseline characteristics in each patient group

	Post-Calcium Group (n=19)	Pre-Calcium Group (n=40)
Age range (Median, years)	18 - 91 (45) years	18 - 93 (48.5) years
Sex		
Male (n, %)	13 (68%)	28 (70%)
Female (n, %)	6 (32%)	12 (30%)
Mechanism of Injury		
Blunt (n, %)	19 (100%)	39 (97.5%)
Penetrating (n, %)	0 (0%)	1 (2.5%)
ISS Range (Median)	9 - 57 (28)	9 - 57 (28)
Range for Time of 999 Call to Initial Blood Gas Reading (Median, minutes)	116 - 252 (155) minutes	88 - 226 (118) minutes
Number of Patient Hypocalcaemic on Arrival*	4	5
Range of initial Calcium levels (Median, IQR) mmol/L	0.79 - 1.39 (1.13, 0.14) mmol/L	0.63 - 1.76 (1.14, 0.11) mmol/L
Units of PRBC given (Mean)	1 - 4 (1.7)	1 - 4 (1.6)

\*Hypocalcaemia defined as an ionised calcium level of 1.00 mmol/L on blood gas

## FIGURE 2 – Flowchart for the exclusion of patients



## RESULTS AND DISCUSSION

- Total of 19 patients in Post-Calcium group, 40 in Pre-Calcium group
- No difference shown in the incidence of hypocalcaemia between the two groups,  $P = 0.999$  (figures 3, 4), despite similar demographics.
- Not enough evidence at present to prove or disprove the intervention in the civilian setting, compared to a study in a military setting, which used similar methodology and found a benefit with supplemental calcium ( $p < 0.001$ )<sup>(2)</sup>.
- A multicentre randomised controlled trial is needed to assess the use of  $CaCl_2$
- 10 patients in the treatment group removed due to clinically reasoned omissions or non-adherence of SOP, out of 29 patients total (34%). Reasons: omission in notes, no second IV line and different dosages/preparations of calcium given.

## FIGURES 3 & 4

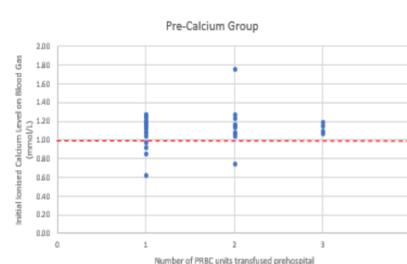


Figure 3: Graph of  $iCa^{2+}$  blood gas results plotted against the number of PRBC given per patient, for the Pre-Calcium group.

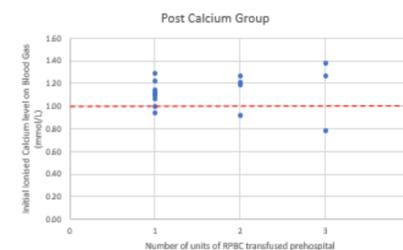


Figure 4: Graph of  $iCa^{2+}$  blood gas results plotted against the number of PRBC given per patient, for the Post-Calcium group.

## CONCLUSIONS

1. Administration of  $CaCl_2$  has become embedded within our management of Code Red patients
2. AAKSS SOP reviewed and amended due to this work; recording of blood gas results, ensuring consistency with  $CaCl_2$  administration.
3. Method for recording blood gas results (inc.  $CaCl_2$ ) improved; taken and recorded at point of care, digital storage of printed blood gas results.

### Further research is needed to:

1. Ascertain if there is a difference in  $iCa^{2+}$  between two larger groups, to inform what a clinically relevant detectable change is in this study population
2. Identify whether  $iCa^{2+}$  is reduced after 1 unit of PRBC, which may have implications for changing SOP as  $CaCl_2$  is currently only given post 2 PRBC units

## REFERENCES

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