Hypocalcaemia in patients at Te Toka Tumai Auckland, who received pre-hospital whole blood transfusion (PHWBT) from Northern Rescue Helicopter Ltd: A preliminary audit.

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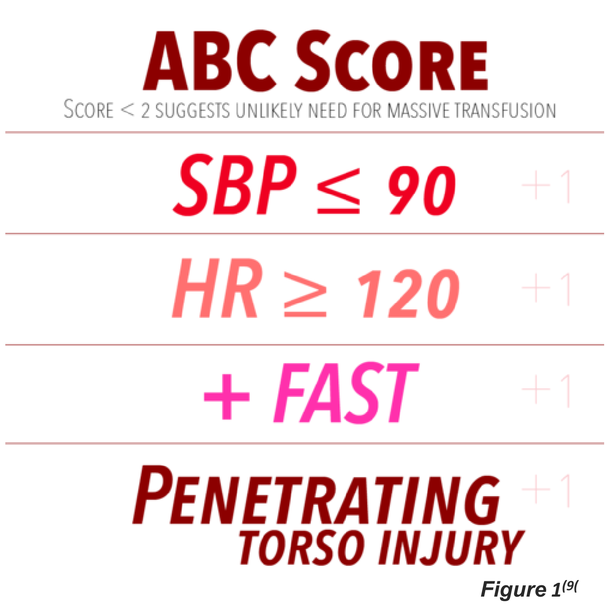

Figure 1[9]

AIM

- **Retrospective audit of all NRHL PHWBT administered between November 2017 and April 2021, to adult patients arriving at Te Toka Tumai Auckland.**
- **Identify the incidence of hypocalcaemia on arrival to hospital.**

iCa2+	Number of patients n=43		Number of Pre-Hospital Blood Units		30 Day Mortality n=9 (21%)	
iCa2+ <=1.12 mmol/L (hypocalcaemia)	21 (48%) 95% CI 35 to 63		One Unit	11 (52%) 95% CI 32 to 72	4 (19%) 95% CI 7 to 41	
	(Severe)	*2 (9%) 95% CI 1 to 30*	Two Units	10 (48%) 95% CI 28 to 68	*(24 Hours)*	*2 (22%) 95% CI 5 to 55*
iCa2+ >= 1.13 mmol/L (normocalcaemia)	22 (51%) 95% CI 37 to 65		One Unit	18 (81%) 95% CI 61 to 93	5 (23%) 95% CI 10 to 44	
			Two Units	4 (18%) 95% CI 6 to 39	*(24 Hours)*	*2 (22%) 95% CI 5 to 55*

Table 1.

BACKGROUND / INTRODUCTION

In 2015 the New Zealand Blood Service (NZBS) at (Te Whatu Ora) Te Toka Tumai Auckland committed to a partnership with the Northern Rescue Helicopter Ltd (NRHL) to provide PHWBT for patients with life-threatening haemorrhage.

Current practice at NRHL is:
- PHWBT (max two units carried) for patients who meet transfusion criteria in a dual clinician (doctor / critical care paramedic) model of care
- NRHL use a modified version of the Assessment of Blood Consumption (ABC) score *(figure 1)* as a trigger for PHWBT. (1,2)

In collaboration with NRHL, Te Toka Tumai Auckland developed a "Code Crimson" protocol for patients who have suspected life threatening haemorrhage.

Current in-hospital practice
- Check ionised calcium (iCa^{2+}) with every 'pack' of the Massive Haemorrhage Pathway (MHP)
- Administer intravenous (IV) calcium if iCa^{2+} is less than 1mmol/L.

Evidence demonstrating those patients receiving PHBT are at risk of developing hypocalcaemia(3) is limited. Other emergency services and aeromedical providers worldwide administer IV calcium routinely with PHBT(3,5,6) but practice varies.

Hypocalcaemia in both trauma and blood transfusion has been associated with increased morbidity and mortality(4,5) and blood transfusion itself is linked to hypocalcaemia.(4,5)

DISCUSSION

Nearly half (48%) of patients who received PHWBT were hypocalcaemic on arrival to Te Toka Tumai Auckland.

- There was a statistically significant difference in rates of hypocalcaemia when looking at how many units of blood were transfused pre-hospital (*p=0.04*) – **with hypocalcaemia more likely when 2 units of blood transfused.**
- Overall 30 day mortality was similar in both groups (*p=0.76*).

Recent changes to the NZBS massive transfusion guidelines at Te Toka Tumai Auckland now include the routine concurrent administration of 1g IV calcium with each MHP box *(see figure 2)*. This is in conjunction with a national Aotearoa New Zealand critical haemorrhage project.(8)

NRHL should consider amending their current PHWBT protocol to administer 1g IV calcium following each 2 units of whole blood transfused in the pre-hospital phase of care.

METHODS

Ethics approval obtained from the Auckland Health Research Ethics Committee (AHREC, ref AH23133)

- **Hypocalcaemia: serum iCa^{2+} <=1.12mmol/L**
- **Severe hypocalcaemia: serum iCa^{2+} is <=0.9mml/L (3).**

Patient records were accessed to obtain demographic data, iCa^{2+} results, mortality and cause of death.

Given the small numbers in our sample, statistical analysis for correlation of hypocalcaemia and mortality is of limited utility. Chi^2 test was used to calculate comparisons between 2 groups.

RESULTS

- 64 adult patients identified with PHWBT.
- 46 transported to Te Toka Tumai Auckland
- 3 did not have an arrival iCa^{2+} available and were excluded (all went straight to theatre with no emergency department bloods)
- **43 adult patients included in analysis**.
- 35% Female. 88% trauma, of which 2/38 (5%) was penetrating trauma
- Cause of death in 66% of cases was severe traumatic brain injury

Table 1 demonstrates relevant information.

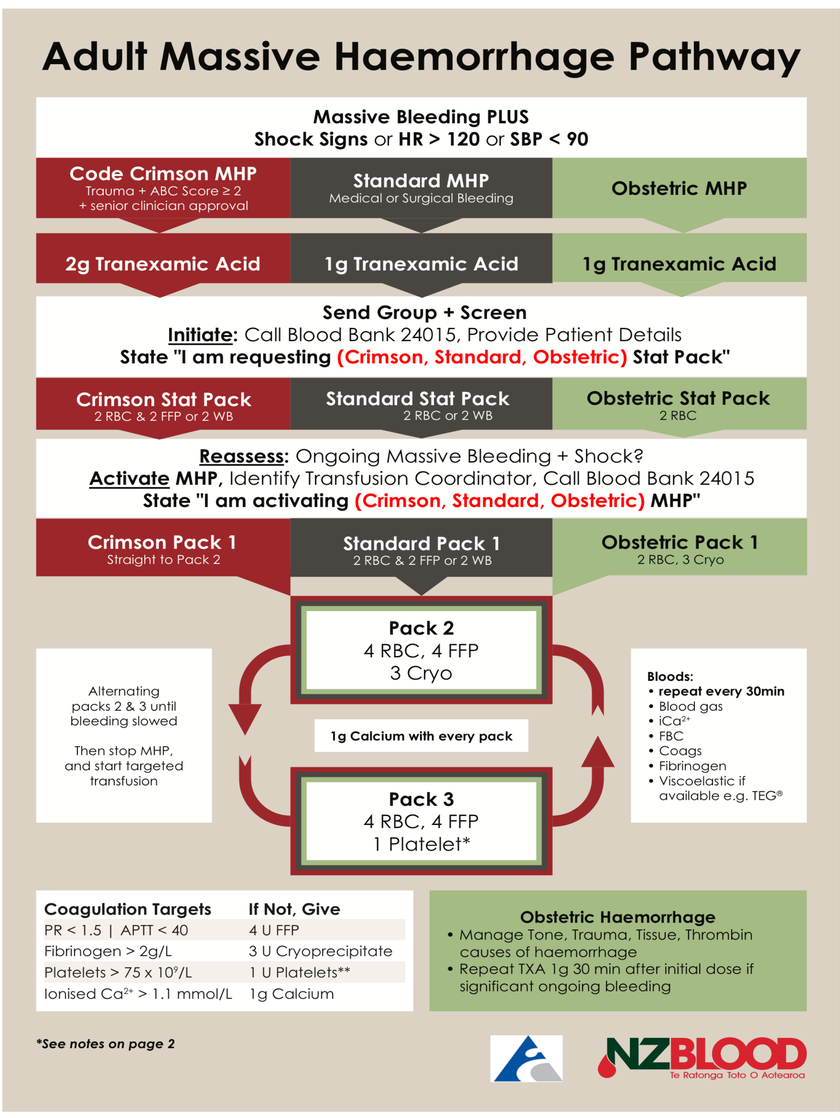

***Figure** 2*

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Te Whatu Ora
Health New Zealand
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NZBLOOD Te Ratonga Toto O Aotearoa

NORTHERN RESCUE