

Are clinical signs significant indicators for pre-hospital hypertonic saline use in traumatic brain injury?

A retrospective cohort study



Taylor, S. ^a, Lyon, R. ^a, and Herbrand, A. ^b
^a Air Ambulance Kent Surrey Sussex
^b ParaCRU, University of Hertfordshire
 samt@aakss.org.uk

INTRODUCTION

Traumatic brain injury (TBI) is a major cause of morbidity and mortality.¹ Management begins in the pre-hospital phase, yet diagnosis of raised intracranial pressure (ICP) is challenging and reliant on clinical signs. Administration of hypertonic saline (HTS) is an accepted therapy, however, supporting evidence is limited and potential benefits could outweigh associated physiological risks.²

This study used data from a UK Helicopter Emergency Medical Service (HEMS) database to investigate administration of 5% HTS for TBI patients. It was hypothesised that pre-hospital administration of HTS to anaesthetised blunt neurotrauma patients has a negative association with raised ICP.

METHOD

Data was collected from electronic records between 1st January 2016- 1st January 2018.³ Patients were >18 years, sustained severe blunt head trauma, received a pre-hospital anaesthetic, survived to hospital and had follow up CT data. CT data was reviewed for raised ICP using the surrogates; midline shift, herniation, mass effect or reported raised ICP. Within this HEMS HTS is administered to TBI patients with a GCS <8 with unilateral/bilateral pupil dilation or progressive hypertension and bradycardia (systolic blood pressure (sBP) >160mmHg and pulse rate (PR) <60).⁴

In this univariate analysis, the Pearson's Chi-square test was used to determine association between the categorical variables. A *p*-value of <0.05 was considered statistically significant. All analyses were undertaken using SPSS Version 24.0.

FIGURE 1 - FLOWCHART OF STUDY POPULATION

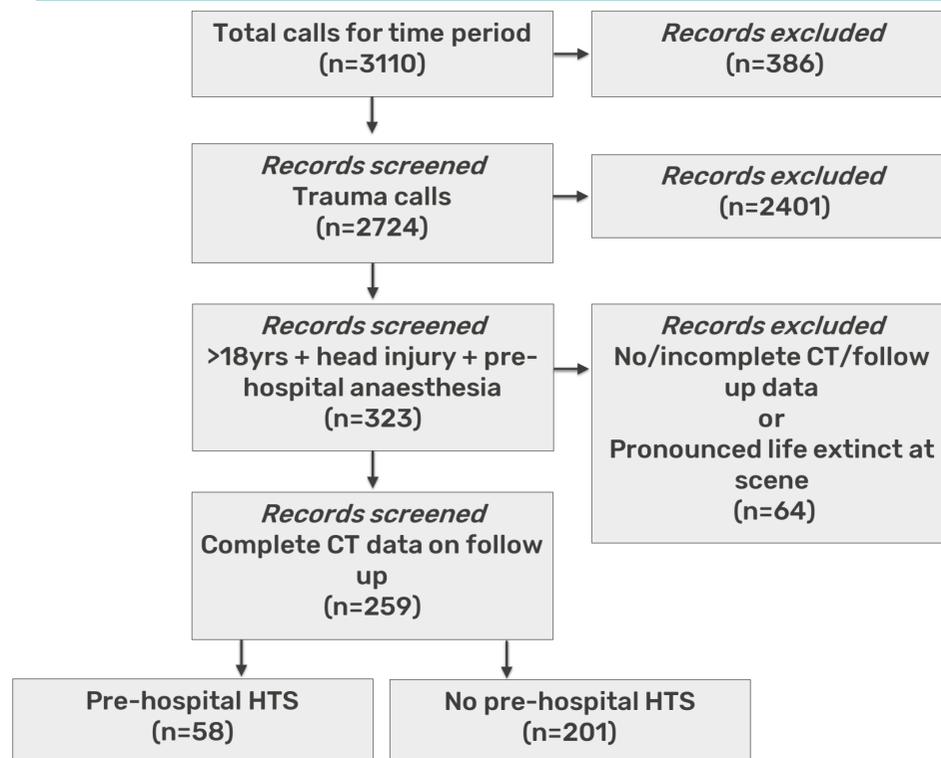


TABLE 1 - DEMOGRAPHIC, ICP & CLINICAL SIGNS

		Raised ICP		No Raised ICP		<i>p</i> -value
Gender (n=235)	Male	63 (75.9%)		108 (71.1%)		
	Female	20 (24.1%)		44 (28.9%)		
Pupil reaction (n=235)	Yes	Left	Right	Left	Right	<0.001 (both eyes)
		46 (57.5%)	41(51.9%)	137 (90.7%)	138 (91.4%)	
	No	Left	Right	Left	Right	
		34 (42.5%)	38(48.1%)	14 (9.3%)	13 (8.6%)	
sBP>160 PR <60 (n=230)	Yes	6 (7.4%)		2 (1.3%)		0.015
	No	75 (92.6%)		147 (98.7%)		

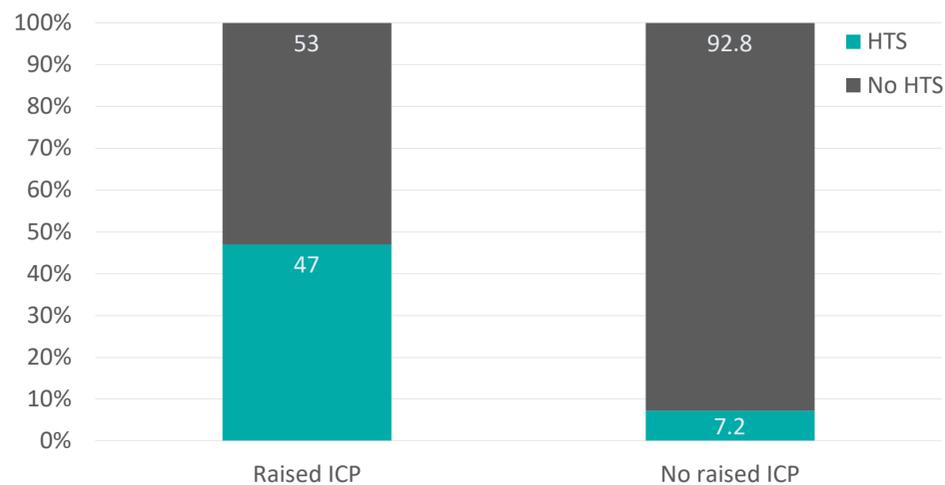
RESULTS AND DISCUSSION

A total of 3110 patients were attended, with 259 included (Figure 1). Of these, 152 (58.7%) had no surrogates for raised ICP, 83 (32%) at least one and 24 (9.3%) were inconclusive and excluded from the analysis.

HTS was administered to 50 patients; 39(47%) had raised ICP and 11 (7.2%) did not; showing a strong association between patients with pathology to suggest raised ICP and pre-hospital HTS administration (*p*<0.001). Of those who did not receive HTS, 44 (53%) had raised ICP.

Results suggest that clinical signs are not consistent when assessing for raised ICP. Six (7.4%) of 81 patients had a sBP>160 and PR <60 in contrast to 75 (92.6%) with raised ICP who did not (*p*=0.015). The proportion of patients with raised ICP and pupillary response (57.5% left eye; 51.9% right eye) is statistically less compared to those without raised ICP (90.7% left eye; 91.4% right eye) (*p*<0.001).

FIGURE 2 - HTS ADMINISTRATION AND RAISED ICP



CONCLUSIONS

This study supports the concept that clinical signs may not be consistent when assessing TBI patients for raised ICP in the pre-hospital setting. Administration of pre-hospital HTS should therefore be with caution. Within this service, HTS is being administered as per guidelines, however patients with raised ICP are potentially being missed. Further research is needed into outcomes and pre-hospital HTS before definitive recommendations can be made.

REFERENCES

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