



**The Effectiveness of Prehospital Hypertonic Saline for Hypotensive Patients:
A Systematic Review and Meta-Analysis**

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No Conflicts of Interest



Background

- The optimal fluid for the prehospital treatment of hypotension is unknown
- Hypertonic fluids may increase circulatory volume and mute the pro-inflammatory response of the body to injury and illness
- Potentially appealing for EMS



Study Aim

In patients presenting with hypotension in the prehospital setting (population), does the administration of hypertonic saline (intervention), compared to isotonic fluid (control), change survival to hospital discharge (outcome)?



Methods

- **Search:** Medline, Embase, CINAHL and CENTRAL searched up to November, 2016
- **Article eligibility:** Independent review by two authors
- **Data abstraction:** apriori data collection form, independent verification of all data
- **Risk of bias:** Cochrane Collaboration's risk of bias tool
- **Data synthesis and analysis:**
 - Fixed effect model
 - Qualitative description of secondary outcomes



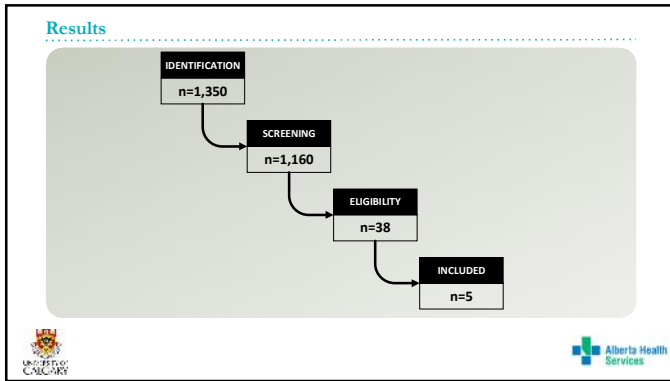
PROSPERO registration # CRD42016053385



Methods

Inclusion/Exclusion	
Patient	Adult and pediatric
Hypotension	Systolic blood pressure of less than 100 mmHg or suspicion of the development of a hypotensive state
Prehospital setting	EMS
Intervention	Sodium chloride concentration greater than 0.9%, no colloid
Control	Isotonic or near isotonic fluids
Study design	Randomized controlled trial





Study	Intervention			Control	
	First author	Country	Fluid (dose)	Co-interventions	Fluid (dose)
Bulger et al. (2011) n=631	USA Canada	7.5% HS (250 ml)	Normal Saline	0.9% NS (250 ml)	Normal Saline
Jousi et al. (2010) n=37	Finland	7.5% HS (300 ml)	Ringer's acetate and colloid	Ringer's acetate and colloid	N/A
Cooper et al. (2004) n=229	Australia	7.5% HS (250 ml)	Ringer's lactate and colloid	LR (250 ml)	Ringer's lactate and colloid
Vassar et al. (1993a) n=95	USA	7.5% HS (250 ml)	"conventional isotonic fluids"	LR (250 ml)	"conventional isotonic fluids"
Vassar et al. (1993b) n=169	USA	7.5% HS (250 ml)	"conventional isotonic fluids"	0.9% NS (250 ml)	"conventional isotonic fluids"

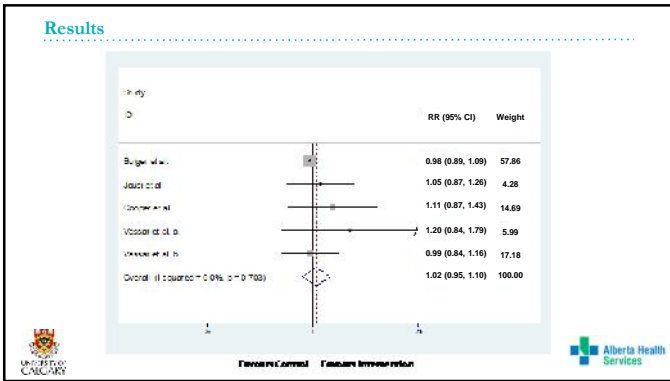
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	Concealed Allocation	Blinding	Intention to Treat	% Sample Size Achieved	Significant Arm Differences
Bulger et al.	●	●	●	23%	Yes
Jousi et al.	●	●	●	N/A	No
Cooper et al.	●	●	●	104%	No
Vassar et al. a	●	●	●	32%	No
Vassar et al. b	●	●	●	43%	Yes

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Results

First author (year)	Longer term survival	Vital Signs	Fluid Requirements	MODS	Length of Hospital Stay	Disability Outcome Scales	Neurological Outcomes Scales	Adverse Effects
Bulger et al. (2011)	⊖	⊖	⊖	⊖	⊖	⊖	⊖	⊕
Jousi et al. (2010)	⊖	⊖	⊖	⊖	⊖	⊖	⊖	⊖
Cooper et al. (2004)	⊖	⊖	⊖	⊖	⊖	⊖	⊖	⊖
Vassar et al. (1993a)	⊖	⊕	⊖	⊖	⊖	⊖	⊖	⊖
Vassar et al. (1993b)	⊖	⊖	⊖	⊖	⊖	⊖	⊖	⊖

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Discussion

- No statistically significant findings:
 - Bunn et al. 2009 – RR 0.87 (95%CI 0.69, 1.04)
 - Wang et al. 2014 – RR 0.96 (95%CI 0.82, 1.14)
- Patients: small number that may benefit
- Fluids: fixed dose and co-interventions
- Safety

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Limitations

- Missed trials
- Civilian EMS systems



Conclusions

There was no significant difference in important clinical outcomes for hypotensive injured patients administered hypertonic saline compared to isotonic fluid in the pre-hospital setting.

Hypertonic saline cannot be recommended for use in pre-hospital clinical practice for the management of hypotensive injured patients based on the available data.