



Natural Experiments:

Effect of Medical Helicopters on Improving Mortality

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Disclosures

- **No conflicts of interest**
- **No financial disclosures**
- **No off label pharmaceuticals or devices**



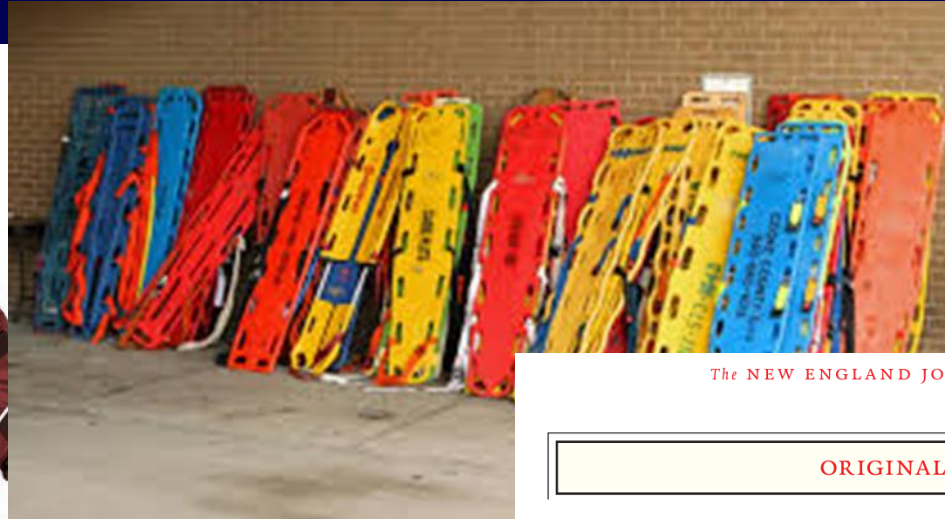
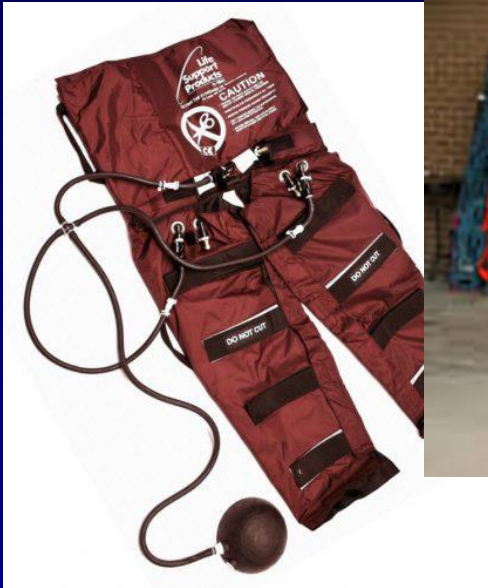
EMS Saves Lives



HEMS Saves Lives



Belief \neq Truth



The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Early Restrictive or Liberal Fluid Management for Sepsis-Induced Hypotension

The National Heart, Lung, and Blood Institute Prevention and Early Treatment of Acute Lung Injury Clinical Trials Network*

N ENGL J MED 388;6 NEJM.ORG FEBRUARY 9, 2023

“However beautiful the strategy, you should occasionally look at the results.”

-Winston Churchill



Interpreting & Applying Research

- **Quality / Strength**

- Design
- Power / size

- **Validity**

- Internal
- External

- **Statistics**

- Appropriate
- Meaningful

- **Conclusions**

Parachutes for Gravitational Challenge

BMJ

December 20-27, 2003

Parachute use to prevent death and major trauma related to gravitational challenge: systematic review of randomised controlled trials

Gordon C S Smith, Jill P Pell

No randomised controlled trials of parachute use have been undertaken.

The basis for parachute use is purely observational, and its apparent efficacy could potentially be explained by a “healthy cohort” effect



“The absence of evidence is not evidence of absence”

-Martin Rees

Natural Experiment

Observational study comparing experimental and control conditions assigned by natural process

Before-After

- Interrupted time series
 - Gain or Loss of HEMS
- **GRADE >”low”**

Helicopter Unavailable

- Weather
- Maintenance
- Concurrent mission
- Staff

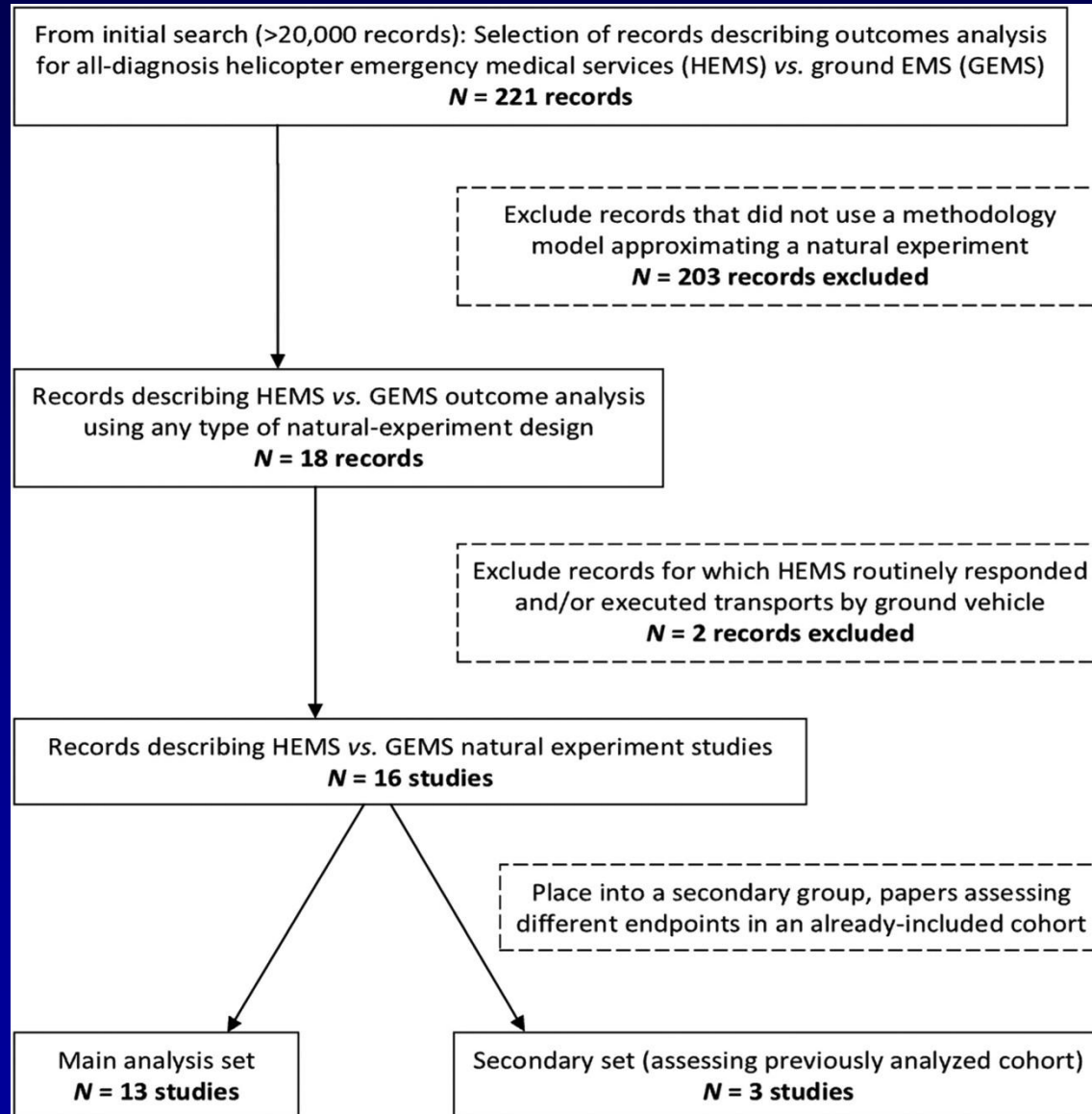


Objective

- **Assess Patient Oriented Outcome that Matters**
 - Mortality
- **Comparing HEMS vs Ground**
- **Evaluate the quality and number of natural experiment studies**



Study Identification & Selection



Risk of Bias

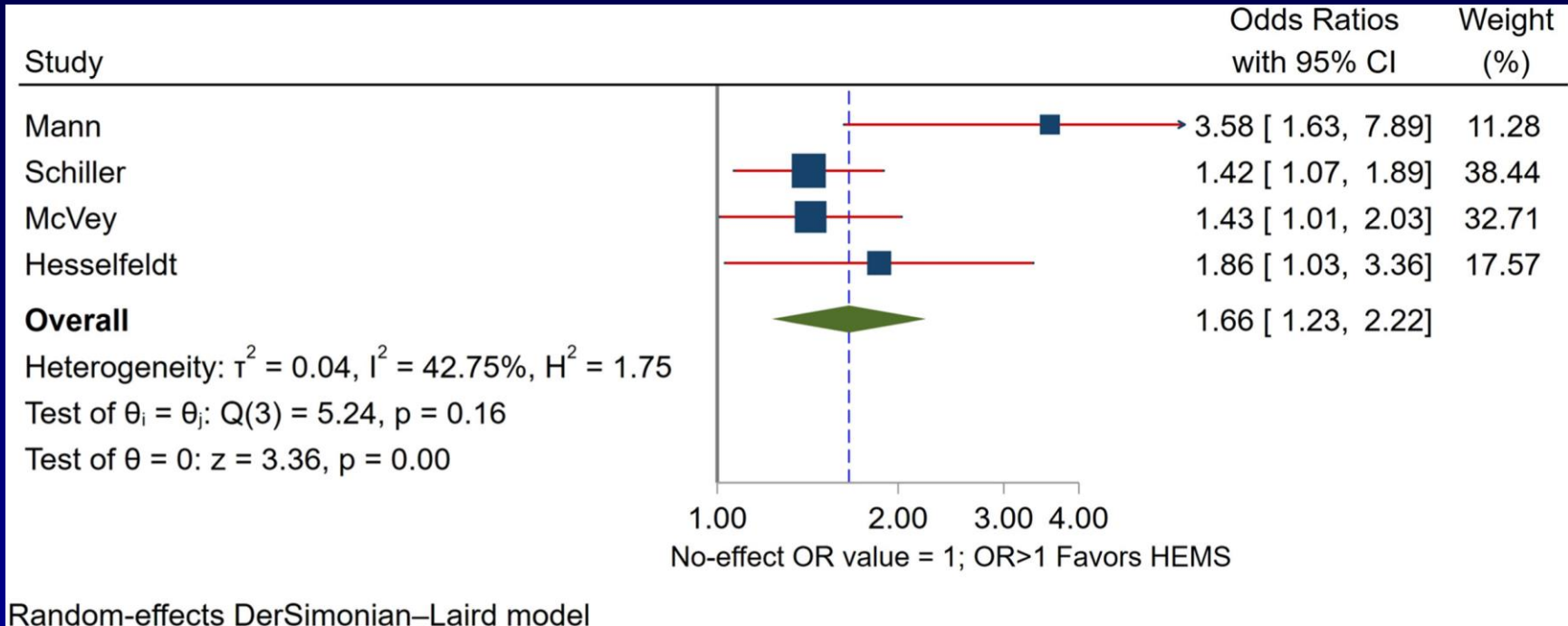
Study	Risk of bias domains							Overall
	D1	D2	D3	D4	D5	D6	D7	
Stone	⊗	⊗	⊕	⊕	⊕	⊕	⊕	⊗
Berns	⊗	⊗	⊕	⊕	⊕	⊕	⊕	⊗
Chappell	⊗	⊗	⊕	⊖	⊕	⊕	⊕	⊗
Mann	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕
Schiller	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕
McVey	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕
Kumagai	?	⊕	⊕	?	⊕	⊕	⊕	?
Fjaelstad	⊖	⊕	⊕	⊕	⊕	⊕	⊕	⊕
Hesselfeldt	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕
Borst	⊖	⊗	⊕	⊖	⊕	⊕	⊕	⊗
Funder(16)	⊕	⊕	⊕	⊖	⊕	⊕	⊕	⊕
Funder(17)	⊕	⊗	⊕	⊖	⊕	⊕	⊕	⊗
Sonne	⊕	⊕	⊕	⊖	⊕	⊕	⊕	⊖
Osteras	⊖	⊗	⊕	⊖	⊕	⊕	⊕	⊗
Zakariassen	⊖	⊗	⊕	⊕	⊕	⊗	⊕	⊗
Joseph	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕

Domains:
D1: Bias due to confounding.
D2: Bias due to selection of participants.
D3: Bias in classification of interventions.
D4: Bias due to deviations from intended interventions.
D5: Bias due to missing data.
D6: Bias in measurement of outcomes.
D7: Bias in selection of the reported result.

Judgement
⊗ Serious
⊖ Moderate
⊕ Low
? No information

Traffic light figure for ROBINS-I summary

Meta-analysis



Pooled HEMS survival OR estimate 1.66 (95% CI 1.23-2.22)

Conclusions

- **Few Studies of HEMS Outcome**
- **Natural Experiments provides reasonable quality evidence**
- **HEMS is associated with a 66% increase in survival odds**



Opportunities

- **Future Natural Experiments should seek to eliminate selection bias**
- **Include multivariable analyses**
 - **Incorporate a transport mode term**



HEMS Saves Lives



Belief = Truth



Questions



Air Medical Journal 43 (2024) 124–132



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Air Medical Journal

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Original Research

Natural Experiment Outcomes Studies in Rotor Wing Air Medical Transport: Systematic Review and Meta-Analysis of Before-and-After and Helicopter-Unavailable Publications From 1970 to 2022



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