



Spinal-boards in Prehospital Trauma: Long-Term Disability Assessment

CPT Inbal Dym, MD

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At the moment of truth,
IDF MEDICAL CORPS.

Disclosures

- CPT Inbal Dym, MD has no conflict to report.
- This study was performed as part of the Israel Defense Forces Trauma and Combat Medicine Branch effort to improve the quality of combat casualty care and received no external funding or support.
- This study was conducted by Mor Rittblat et al.



Introduction – The Use of Spinal-boards for Spinal Motion Restriction

Spinal Cord Injury Prevention

Protects the spine during transport

Casualty Extraction

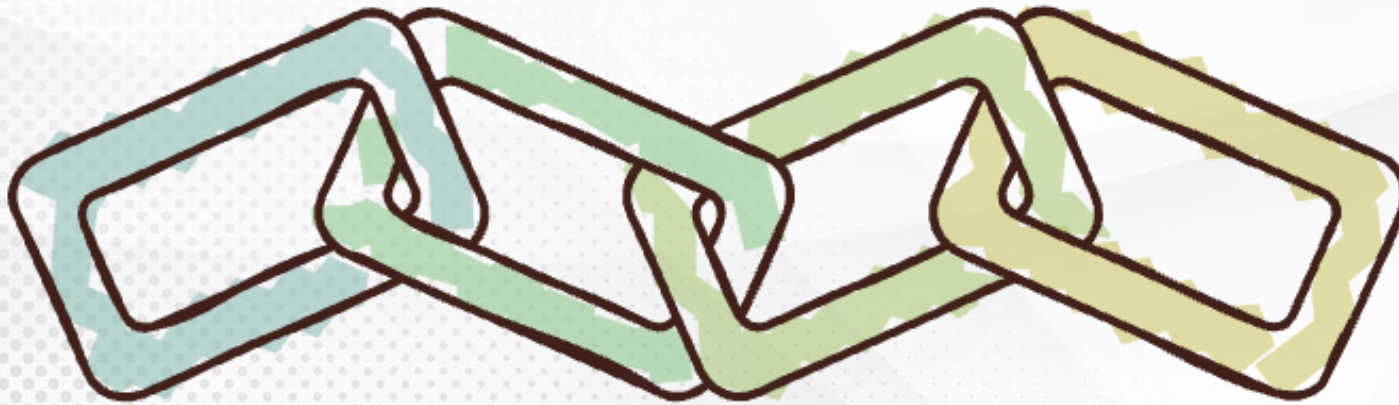
Facilitates safe removal from the scene

Medical Transport

Ensures stability during movement

Secondary Injury Prevention

Minimizes risks during handling



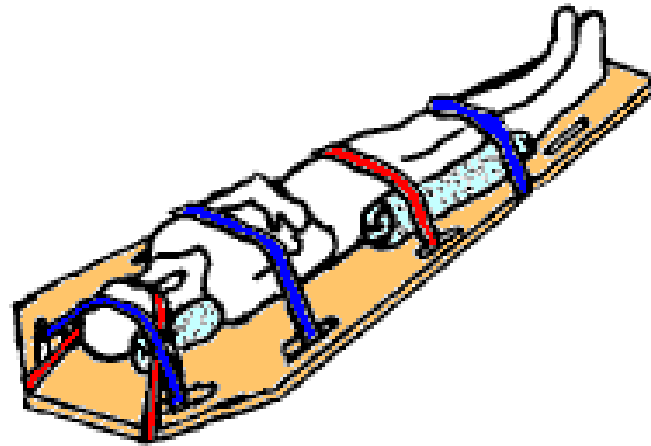
Unclear long-term impact

Does SMR affect long-term disability – especially in young, healthy patients and combat-related injury?



Study Objective

- Analyze the use of spinal-boards among military prehospital medical teams.
- Assess both short- and long-term spinal injury outcomes among casualties immobilized using spinal-boards.





Methods

Retrospective case–control study of active-duty military personnel treated for spinal or cervical injury (AIS-coded).

Jan 2006–Dec 2021



IDF Trauma Registry (IDF-TR)

Point-of-injury data:
vital signs,
mechanism, life-
saving interventions,
prehospital course



Israel National Trauma Registry (INTR)

In-hospital data:
AIS/ISS, ER course,
operations, from 21
of 26 Israeli hospitals



Ministry of Defense Rehabilitation Dep. (MOD-RD)

Long-term outcomes:
service-connected
disability claims &
diagnostic categories





Methods

Population

Military personnel hospitalized with spine/neck injuries warranting backboard + C-collar per IDF guidelines

SMR exposure

Backboard placement recorded by prehospital providers (IDF-TR) or documented on ER arrival (INTR)

Severe injury

Defined as AIS ≥ 3 in a given anatomical region

Primary outcome

Motor, sensory, or autonomic neurologic disability (hemiplegia, paraplegia, quadriplegia, bladder incontinence)

Secondary outcome

Spine-related service-connected disability category (MOD-RD)





Methods – Statistical Analysis

- ✓ **Bivariate comparisons:** Chi-square / Fisher's Exact (categorical); Mann–Whitney U (continuous, presented as median [IQR])
- ✓ **Logistic regression:** Univariable & multivariable models; backboard placement as primary exposure of interest
- ✓ **Adjustment covariates:** Age, sex, injury mechanism, and severe injury ($\text{AIS} \geq 3$) in head, face, neck, thorax, abdomen, spine, extremities
- ✓ **Subgroup analysis:** Repeated in non-penetrating injury subgroup





Results

445

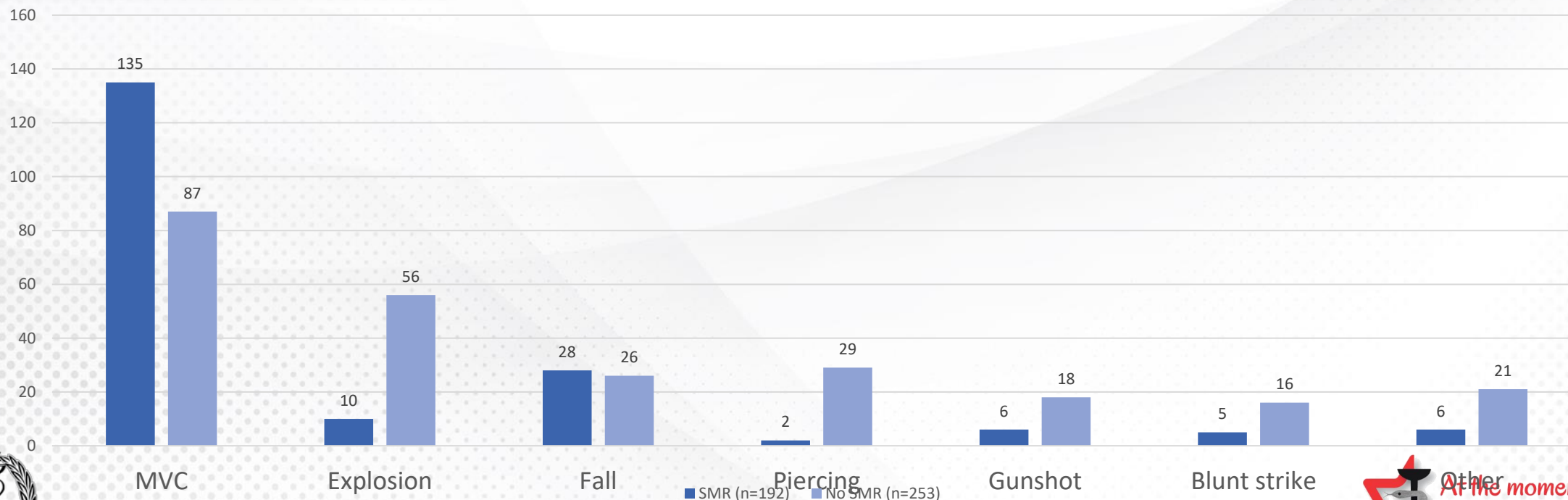
casualties with
spine/neck injury AIS
documentation

Most common mechanism of injury:
motor vehicle collision (49.9% overall)
— but distribution differed sharply by
group.

192 (43.1%)

immobilized with a
spinal-board (SMR)

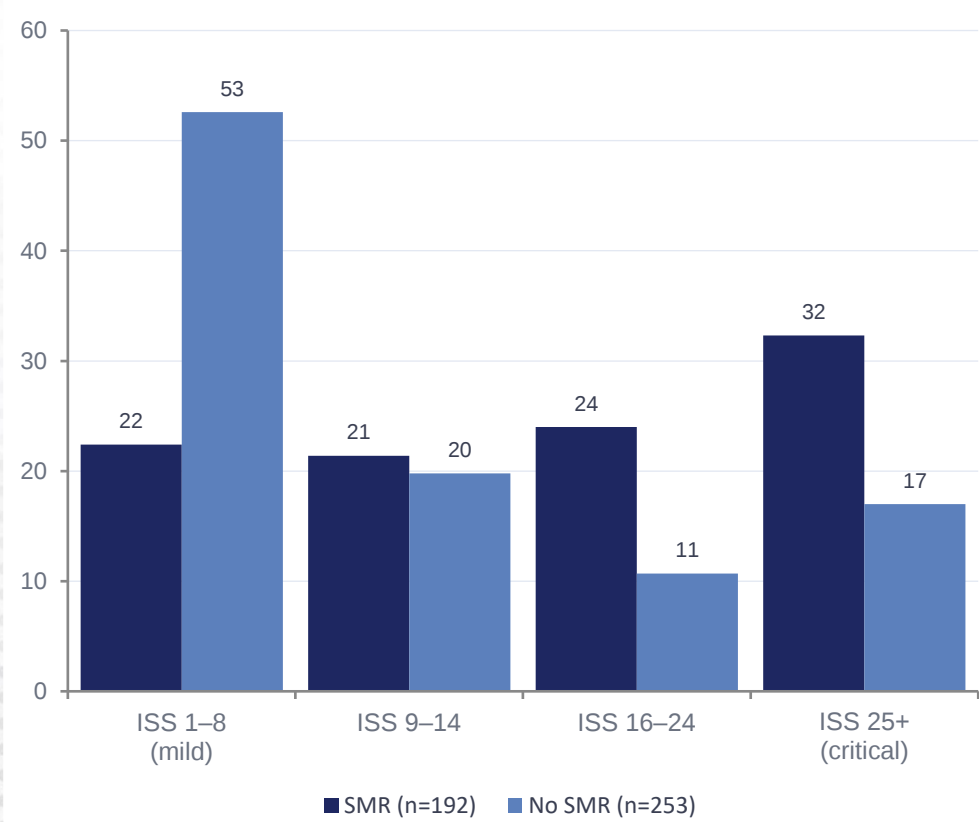
Mechanism of Injury





Results

Injury Severity Score distribution (%)



The SMR group was significantly more severely injured



Severe injury by region (AIS $\geq$ 3)

Higher in SMR group for spine, thorax, abdomen, extremities

Higher in No SMR group for head injury.

P < 0.005 each

Despite the SMR group's higher injury severity, **no statistically significant differences** were observed between groups across any **prehospital life-saving interventions**



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Results

No significant difference

in neurologic disability – hemiplegia, paraplegia, quadriplegia, bladder incontinence) between groups – nor in overall service-connected disability score.

Spine-related disability was higher in the SMR group

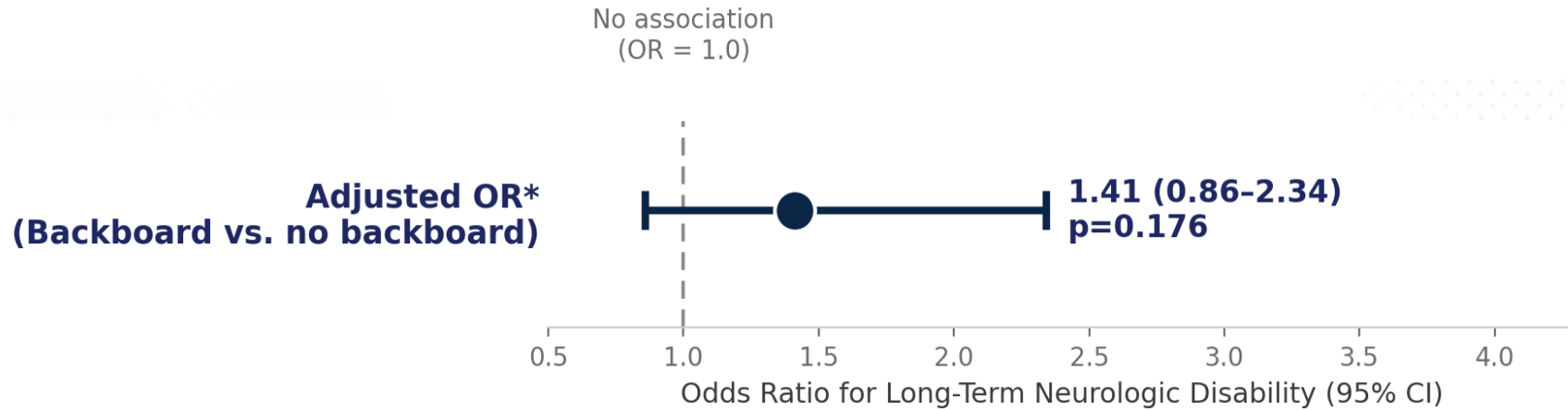
36.5% vs. **24.1%**

P = 0.005





Results



Adjusted for: age, sex, injury mechanism, and severe injury ($\text{AIS} \geq 3$) in head, face, neck, thorax, abdomen, spine, extremities.

Subgroup of non-penetrating injury (n=332): AOR 1.37 (95% CI 0.78–2.41)





Discussion

- **Fischer et al. (2018)** Lack of outcome data supporting routine SMR; advocates selective, protocol-based application
- **Hauswald et al.** Backboard immobilization associated with higher odds of **neurologic disability** (OR 2.03, 95% CI 1.03–3.99)
- **Haut et al.** Increased **mortality** with spine immobilization in penetrating trauma (AOR 2.06, 95% CI 1.35–3.13)
- **Hood et al.** (47+ studies)& **Kwan/Bunn** Systematic reviews : no high-level evidence of neurological benefit from SMR, leading to the conclusion that routine SMR cannot be recommended.
- **Mitchnik et al. (IDF cohort)** No association between C-collar use and cervical injury incidence or neurologic disability





Discussion



▶ Limited Effectiveness

SMR may not prevent secondary injuries caused by initial trauma or neuroinflammation

▶ Spinal Instability

Penetrating trauma often causes direct injury, leaving little room for SMR to prevent secondary damage

▶ Underpowered Study

The study may not have enough participants to detect statistically significant differences

▶ Residual Confounding

Factors like injury severity and provider judgment may influence SMR application and outcomes

▶ Time-Consuming Application

SMR application can prolong scene time and delay transport to definitive care





Limitations

- Retrospective design limits causal inference
- Young, healthy military cohort — limited generalizability to civilian or older populations
- Low incidence of neurologic outcomes may limit statistical power
- Residual confounding possible despite multivariable adjustment (provider expertise, environment, logistics)



Conclusions and Summary

- No significant association between prehospital SMR with spinal-boards and long-term neurologic disability in military personnel with spine and/or neck injuries.
- Is routine use of SMR necessary ?

(Specifically for young, otherwise healthy combat trauma population)



Thank you!



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