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Course Name: Trauma and Environmental Conditions in Paramedic Practice.

Title: C-spine immobilisation is not necessary in upper body gunshot wound management.
Report by Drew Younger
Clinical scenario: Paramedics respond code one to a 36-year-old male who has received a gunshot wound to the sternal end of his right clavicle, anteriorly. Once on scene, the patient is discovered conscious, laying supine and haemorrhaging from the wound. No abnormalities are found upon assessment of the patient's motor and sensory function, and he does not have cervical spine tenderness upon palpation. Despite this, the operating paramedics are required, as per their clinical guidelines, to proceed with spinal immobilisation of this patient.

PICO: In patients with upper body gunshot wound injuries, does pre-hospital cervical spine immobilisation improve patient outcomes?

Search rationale: Routine spinal immobilisation has long been an established practice in trauma protocols and guidelines, despite a lack of direct evidence in its effectiveness and growing concerns for associated complications in penetrating trauma. Specifically, in upper body gunshot wounds there are worries that spinal immobilisation may increase intracranial pressure, cause delay in further treatment injury and even interfere with other vital procedures, such as endotracheal intubation. Furthermore, the actual incidence of spinal injury following such mechanisms appears to quite low, however there is little research to substantiate these claims. For this reason, a search will be performed to further validate these concerns and possibly put current clinical practice guidelines in question as to their effectiveness in improving patient outcomes.

Search Strategy:

Search terms: (GSW* OR "gunshot wounds" OR "penetrating injury") AND ("cervical spine immobilization" OR "spinal immobilisation" OR "spine immobilisation" OR "spinal immobilization" OR "c-spine immobilization").

Databases: Medline (OVID) and PubMed.

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10 sources identified once duplicates removed.

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2 sources identified once publication date limits applied (2014 and onwards only).

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5 sources identified through the addition of sources discovered in the reference lists of relevant articles.

Total Relevant Papers: 5

Author & Date	Population: Sample Characteristics	Design & Level of Evidence	Outcome	Results	Strengths & Limitations
Schubl et al., 2016	Patients presenting with GSWs to the head or neck at an urban, level 1 trauma centre over a four year period.	Retrospective Level II	Identification of how frequently penetrating upper body injuries actually result in cervical spine injury in to determine	Of 36 GSW patients, only five had a cervical spine fracture, two of these were considered unstable.	(+) Study spanned across a four year period. (+) Entirely specific to the topic being investigated.

			whether prehospital spinal immobilisation is necessary or ineffectual.		(-) Small sample size (36). (-) No comparison of outcomes of confirmed spinal injury patients who did versus did not receive spinal immobilisation.
Kong et al., 2018	Patients presenting with cerebral GSWs to the at the Pietermaritzburg Metropolitan Trauma Service in South Africa over a five year period.	Retrospective Level II	Identification of the actual incidence of concomitant cervical spine injury in the presence of isolated cerebral GSWs.	Of 102 patients, 27 had a cervical collar placed pre-hospitally and the remaining 75 were applied a collar in the ED. Of these patients, all received cervical spine radiography revealing no detectable injury in any of these patients.	(+) Data inclusion for study spanned across a five year period. (+) Relatively large sample size (102). (-) Not entirely specific to the pre-hospital setting as placement of spinal collars in the ED was also included.
McNickle, Chestovich & Fraser, 2020	Isolated craniofacial GSW injuries extracted from a Level I trauma centre registry from 2013-2017 and the US National Trauma Data Bank from 2012–2016.	Retrospective Level II	Quantification of the actual incidence of cervical spine injuries verses unnecessary immobilisation in GSWs to the head through CT scanning.	Of 6090 isolated craniofacial GSW injury patients, cervical spine fractures were identified in just 3.7% of the population, despite 121 of the cases from the Local trauma registry receiving cervical spine immobilisation prior to admission.	(+) Large sample size (6090). (+) Data inclusion for study spanned four years. (+) Data included was extracted data from two registries. (+) Data is specific to the prehospital setting. (-) Data is specific to craniofacial injuries only.
Eftekhary, Nwosu, McCoy, Fukunaga & Rolfe, 2016	GSW-related spinal cord injury patients transferred for rehabilitation to a nationally renowned centre over a 14 year period.	Retrospective Level II	Identification of the commonness of actual spinal instability in GSW patients who received spinal precautions to confirm the overutilization of bracing.	Of 396 patients who were placed in a spinal immobilisation collar prior to arrival at the rehabilitation centre, all had the collar removed as their injuries were considered stable and did	(+) Large sample size (396). (+) Data inclusion for study spanned 14 years. (-) Data is not specific to prehospital setting. (-) Data is not specific to upper body injuries.

				not require bracing.	(-) Data is not specific to just cervical spine injuries.
Garcia, Liu & Victorino, 2014	A hypothetical cohort of 20-year-old males presenting with penetrating head and neck trauma who were transported to a US hospital.	Cost-Benefit Analysis Level II	Recognition of whether the pre-hospital spinal immobilisation of penetrating head and neck injuries is cost-effective for patients in terms of differences in overall quality-adjusted life-years.	Just 0.2% of penetrating trauma produced unstable spine injury and just 7.4% of the patients who underwent spine stabilization had neurologic improvement.	(+) Centred around pre-hospital management. (-) Not focused on patient prognosis, rather the cost involved in treatment and management. (-) Hypothetical cohort derived from published studies and public data, not actual trials or studies. (-) Very specific cohort; may render conclusions invalid to general population.

Abbreviations: GSW; gunshot wound. ED; emergency department. CT; computed tomography. C-spine; cervical spine.

Conclusions: In patients with upper body gunshot wounds, cervical spine immobilisation does not seem necessary due to the insignificance of actual spinal injury in these patients. The evaluated data demonstrates this, with all five of the studies concluding that very infrequently is there spinal injury caused by upper body gunshot injuries and furthermore that there is little benefit to spinal immobilisation even in the presence of suspected spinal involvement. Therefore, conclusions extrapolated from this review further support concerns that c-spine immobilisation is unnecessary and may cause more harm than benefit. However, a substantial amount of further research and study into the topic is required before evidence-based changes to clinical practice guidelines can be warranted.

Consider: As aforementioned, there is a considerable amount of evidence to support the belief that c-spine immobilisation is unnecessary in upper body gunshot wounds. However, for such findings to be utilised for suggestions to change current clinical guidelines, there needs to be a more specific approach to the pre-hospital setting. Several of the included studies for review did not focus on prehospital management, therefore hindering the validity of these claims for the prehospital setting. Hence, further research with full specificity to prehospital upper body GSW spinal management should be considered in order to fully validate such claims and thus influence the current clinical guidelines in place.

Clinical Bottom line: C-spine immobilisation does not appear necessary in upper body gunshot wound management, however spinal precautions in such patients should continue to be taken until there is further prehospital-specific evidence that warrants any changes to clinical practice guidelines.

References

Eftekhary, N., Nwosu, K., McCoy, E., Fukunaga, D., & Rolfe, K. (2016). Overutilization of bracing in the management of penetrating spinal cord injury from gunshot wounds. *Journal of Neurosurgery: Spine*, 110-113. doi:10.3171/2015.12.SPINE151022

Garcia, A., Liu, T. H., & Victorino, G. P. (2014). Cost-utility analysis of prehospital spine immobilization recommendations for penetrating trauma. *The Journal of Trauma and Acute Care Surgery*, 534-541. doi:10.1097/TA.0b013e3182aafe50

Kong, V. Y., Weale, R. D., Sartorius, B., Bruce, J. L., Laing, G. L., & Clarke, D. L. (2018). Routine cervical spine immobilisation is unnecessary in patients with isolated cerebral gunshot wounds: A South African experience. *Emergency Medicine Australasia*. doi: https://doi-org.libraryproxy.griffith.edu.au/10.1111/1742-6723.12985

McNickle, A. G., Chestovich, P. J., & Fraser, D. R. (2020). Cervical Spine Injury is Rare in Self-Inflicted Craniofacial Gunshot Wounds: An Institutional Review and Comparison to the US National Trauma Data Bank. *Prehospital and Disaster Medicine*. doi: https://doi.org/10.1017/S1049023X20000771

Schubl, S. D., Robitsek, J. R., Sommerhalder, C., Wilkins, K. J., Klein, T. R., Trepeta, S., & Ho, V. P. (2016). Cervical spine immobilization may be of value following firearm injury to the head and neck. *The American Journal of Emergency Medicine*, 726-729. doi:10.1016/j.ajem.2016.01.014