Clinical question.

In victims with suspected cervical spinal injury does spinal immobilization benefit the patient over doing nothing in outcome?

Is this question addressing an intervention/therapy, prognosis or diagnosis? Intervention/therapy

State if this is a proposed new topic or revision of existing worksheet: revision of an existing worksheet

Conflict of interest specific to this question

Do any of the authors listed above have conflict of interest disclosures relevant to this worksheet? Paul Satterlee has no conflict of interest disclosures relevant to this worksheet

Search strategy (including electronic databases searched).

Search of Pubmed, Embase and Cochrane database using the terms prehospital, emergency medical services, first aid, cervical spine injury as well as cervical collar all in text.

Review of references from 2005 guidelines and looking for other research referencing articles in that list.

Searching the AHA Endnote library using cervical spine injury, cervical collar, first aid, emergency medical services and prehospital

Search of Pubmed using MeSH headings of Emergency Medical Services, First Aid and Spinal cord injuries

State inclusion and exclusion criteria

Evidence was limited to peer-reviewed, English language journals. Only evidence involving human were considered.

Number of articles/sources meeting criteria for further review:

Endnote 7 search of terms above produced 28 articles.

Search of Cochrane database revealed 2 relevant articles. There were no randomized control trials involving traumatically injured patients.

Search of Embase using cervical spine injury and emergency care produced 24 articles. A search using cervical spine injury and prehospital produced 43 articles, which all relevant articles had been previously identified.

Search of PubMed for Cervical spine injury and prehospital produced 42 articles, many referring to criteria to use in determining the use of spinal immobilization by paramedics. There were 10 articles with at least some relevance.

Search of PubMed for cervical spine immobilization and Emergency Services produced 93 articles with only one previously unfound entry.

Review of the 28 references from the 2005 guidelines was performed.
Summary of evidence

Evidence Supporting Clinical Question
In victims with suspected cervical spinal injury does spinal immobilization benefit the patient over doing nothing in outcome?

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A = Return of spontaneous circulation  B = Survival of event  
C = Survival to hospital discharge  D = Intact neurological survival  
E = Other endpoint  Italics = Animal studies
Evidence Neutral to Clinical question
In victims with suspected cervical spinal injury does spinal immobilization benefit the patient over doing nothing in outcome?

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A = Return of spontaneous circulation   C = Survival to hospital discharge   E = Other endpoint
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Evidence Opposing Clinical Question
In victims with suspected cervical spinal injury does spinal immobilization benefit the patient over doing nothing in outcome?

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<td>Lerner 1998 -E</td>
<td>Raphael 1994 E</td>
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<td>Kolb 1999 –E</td>
<td>Hunt 2001- E</td>
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<td>Schafermeyer 1991 E</td>
<td>Bauer 1988 E</td>
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<td>Lennarson 2001-E</td>
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<td>Barkana 2000 E</td>
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A = Return of spontaneous circulation   C = Survival to hospital discharge   E = Other endpoint
B = Survival of event   D = Intact neurological survival

*Italics = Animal studies*
**REVIEWER’S FINAL COMMENTS AND ASSESSMENT OF BENEFIT / RISK:**

**Evidence Supporting**
Literature review provides no good evidence that placement of a cervical collar provides any benefit to a victim with suspected cervical spine injury. The author recognizes the difficulty in gaining IRB support for a prospective, blinded outcome study of this subject.

**Evidence Neutral**
Some evidence found showed that many techniques of cervical spine immobilization were ineffective at preventing motion. (Podolsky, Del Rossi) Furthermore, there is evidence that basic and advanced airway maneuvers can cause cervical motion despite cervical collar placement (Aprahamian) and that manual stabilization is a better method of preventing movement in these situations. (Gerling). Curran 1995 LOE 4 showed only 10% of 118 pediatric patients with cervical spine precautions in place were found to be in a neutral cervical position. This evidence indicates that the techniques currently being used are not sufficient to provide the intended effect and therefore, may not be necessary or any better than doing nothing.
The evidence by Hauswald, 1998, addressed the question most directly. It was a retrospective case review comparing the management of victims of blunt trauma in two different countries. One utilized pre-hospital spinal immobilization and the other did not. The research showed a less than 2% chance that immobilization had any benefit.

**Evidence Opposing**
Evidence shows numerous detrimental effects of cervical immobilization. March and Lerner showed significant incidence of pain developed in healthy, immobilized patients despite some padding. Placement of a cervical collar can elevated the ICP of patients with head injuries (Mobbs, Hunt) and non-injured patients (Raphael, Kolb). Bauer and Shafermeyer showed reductions in respiratory function in healthy adults as well as children during immobilization on a long board. It is appropriate to consider the studies that focus on long board immobilization since it is a common aspect if cervical spine immobilization. Finally, Barkana showed the risk of placing a cervical collar and preventing identification of penetrating injuries to the neck.

**Acknowledgements:**

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**Citation List**


*Level of evidence is 5 because it is a model. Quality is poor, it is neutral. Summary is that the model study using cadavers with simulated injuries showed little restriction of movement using a specific kind of collar. The relevance is limited, however, some first aid does teach airway measures, which are discussed here and shown to manipulate injured areas.*


*Level 4, retrospective no controls, poor quality, relevance is moderate. Summary. Showed that people with penetrating neck injury rarely have unstable spine injuries that would benefit from a collar and, in 22% of cases, a collar would have masked a sign of a life threatening injury.*

LOE 2 fair quality. Showed decreased pulmonary function tests in healthy volunteers who were immobilized on a long board as well as a specialty extrication device.


LOE 2 concurrent controls(self). Quality poor. Shows many persons complained of pain within 30 minutes and 29% had delayed pain symptoms.


Loe 2, concurrent controls, quality is fair. Summary: healthy volunteers get pain at various points after being immobilized. More likely on a backboard than on a vacuum mattress.


Loe 2, concurrent controls, fair quality. 20 healthy people, randomised and controlled against themselves. Showed pain and pressure while immobilized on a long board, but improved when a mattress was used.


LOE is 4 no controls, poor quality, good relevance, negative. Summary is that they reviewed the positioning of the c-spine via x-ray in 118 consecutive kids when immobilized. 10% were in neutral position. Greater than 5 degrees of either direction in 60%


LOE 3 retrospective, with retrospective controls, (those with injury and no degradation). relevant in that they were looking to see if there was something that attributed to the decline, but only thing addressed was delay in x-ray. No comment about whether or not those people had collars or not and if there was a correlation.


LOE 5 due to models. Relevance is good, argues against using collar. Using cadavers and precise measuring of the movement at the injury showed no benefit of any of the three collars in reducing movement of the spine in typical movements that FR and FA provides would expect to have to do next log roll or lift and slide.


Retrospective without control. Gives it a level 4. The quality is not relevant, not and RCT. There is minimal relevance other than to argue that there are unrecognized injuries and being as careful as possible is warranted. Summary: retrospective study of 5 years of patients with cervical spine injuries from MVC and falls. Results show that injuries are more common as the GCS declines and a 4% rate of injury without fracture or subluxation.


Incomplete info. level 2 due to concurrent controls. unclear if it made a difference in tidal volume. Quality is good. This would be supportive since it indicates no adverse effects of the therapy. This is a small, self control study of 38 anesthesized patients who had there tidal volumes measured with and without a collar and were found to have little difference.

LOE level 4, no controls. Relevance limited. Quality is fair. Summary: assessment of whether or not MOI is useful in identifying people with spinal injuries when using typical criteria. Data showed criteria alone identified the same highly sensitive number of people in both high risk mechanisms and low risk. Relevance is that we shouldn't have first aid people use this in the decision making process for a collar.


LOE 5, model used poor quality. Relevance good. Summary, 14 cadavers with manufacture injuries were imaged using fluoroscopy and showed that there was less movement with in line compared to c-collar. Relevance is that first aid providers may be better of using in line, rather than collar. Recognizing that particular motion may not be a spontaneous one, it may be a motion made during movement to stretcher etc.


LOE 5 models, only 2 subjects, not able to represent truly injured patients. Relevance is limited since we are asking is a collar necessary. If they could show that the movement is the same or less than when a collar is placed then it may help answer our question.


LOE 3 retrospective controls, Very relevant, quality is poor. retrospective eval of data from 2 sites, one where spinal precautions are not done and the other are. Logistic regression showed no less disability in site where spical precautions are used.


LOE 2, concurrent controls, fair not supportive. Summary: Patients with head injury and elevated ICP showed increased ICP when a cervical collar was placed.


LOE 2, concurrent controls, fair, not supportive Summary: 20 patients undergoing LP had ICP at lumbar level measured before and after c-collar placement. ICP increased a stat. sig amount but unclear if clinically sig


LOE 4, fair, not supportive. Summary, 10 cadavers were used to simulate cervical injuries, then imaging performed to see the effects of intubation on the injured site. Also, they showed that immobilization increased subluxation.


LOE 1 RCT with controls, not supportive. Summary: 39 volunteers underwent immobilization and developed pain in the neck and occiput regardless of occipital padding. 8-12 percent reported neck pain 24 hours after the trial. More evidence that immobilization is painful and may confuse the clinical picture.

LOE 2 with concurrent controls, fair, no randomization. Not supportive of the hypothesis. Summary: 20 volunteers placed in full immobilization. After 60 minutes, 5 had vertebral tenderness, 18 complained of discomfort. This is an argument that pre-hospital immobilization may add symptoms that make the in-hospital assessment more difficult and cause more pain for the patient.


LOE 2 concurrent controls, not supportive, fair. Summary: 10 patients with CHI had ICP measured before and after cervical collar placement and 9/10 showed significant increase in ICP. Relevant in that it argues a detrimental effect of using a c-collar.


LOE 3 retrospective with controls, those without head injury and those with. Neutral. Summary: Restrospective review of 1200 trauma patients showing no greater incidence of CSI in those with head injury and those without. In deciding if immobilization is helpful, it is important to know if we are making assumptions that are correct.


LOE is 2, concurrent controls, fair due to no blinding or randomization. WOuld fit as supportive of the clinical question. Summary - A prospective, controlled trial that assessed the motion limitation of various types of immobilization. Importantly, it did compare to no immobilization which supports it ias a first aid skill in that is does prevent movement. Whether or not the movement is relevant or dangerous remains to be seen.


Level 1 due to randomised, fair because the blinding was limited, impressive outcome. Study is a RCT that measured the CSF pressure at the lumbar level with and without a c-collar in pre-op patients. Not a typical population, small number, but important outcome.


Level 2, fair quality, showed decreased pulmonary function in peds patients. Healthy volunteers. did involve spinal immobilization based on text and illustrations.