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Cervical Spine X-rays in Trauma

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Why is this important?

Vast numbers of cervical spine x-rays are ordered, with a relatively low yield in identifying the small subgroup who have significant cervical spine injuries (significant injury rate is only around one-and-a-half to three per cent).[1,2,3] Also, research has shown that there is poor agreement between doctors in the decision to order, or not order, cervical spine x-rays.[4]

From a system perspective, unnecessary cervical spine x-rays come at a substantial cost – prolonging the emergency department stays with increased bed occupancy and, in some cases, increasing the use of further expensive imaging, such as CT scanning.

From the patient's perspective, the need for immobilisation in a cervical collar while awaiting x-rays and their results is also associated with risk. Documented complications include pain, pressure sores, airway compromise, elevated intracranial pressure, sepsis and thromboembolism.[5]

The need to order cervical spine x-rays can be significantly reduced by applying one of the clinical decision rules for adult patients presenting with trauma.

Best available evidence

Two large studies have produced clinical decision rules to guide cervical spine x-ray ordering in blunt trauma patients: the NEXUS Criteria and the Canadian C-Spine Rule.[1,2]

Both rules were designed to have a high pick-up rate for detection of cervical spine injury while reducing unnecessary x-ray ordering. The NEXUS criteria have wider applicability and simplicity but the more complex Canadian C-Spine Rule performs better.[3]

Both studies were conducted in North American populations, raising questions about their generalisability to other populations. However, they represent the best information we currently have.

Current practice

Two Australian studies have looked at the application of these rules to local populations. One study used the Canadian C-Spine Rules and found a significant drop in the x-ray ordering rate (from 67 per cent to 50 per cent) and a trend towards a shorter time in a hard collar.[6] Another study using the NEXUS criteria was able to show a modest reduction (from 22.7 per cent to 16.3 per cent) in inappropriate x-ray ordering.[7]

Implications

The published evidence suggests that modest but important gains in limiting inappropriate cervical spine x-ray ordering can be achieved by the use of the Canadian C-Spine or NEXUS rules. These gains occur without a greater risk of missed injuries.

NEXUS Criteria[1] are designed to be applied to all blunt trauma patients with **suspected** cervical spine injury (mechanism or force consistent with neck injury).

The neck can be clinically cleared – **ie x-ray is not indicated** – if the patient meets **all** of the following criteria:

- Normal alertness
- No intoxication
- No mid-line cervical tenderness
- No focal neurological deficit
- No painful, distracting injury (eg other fracture).

The Canadian C-Spine Rule[2] is applied only to **alert and stable** adult trauma patients with mechanism or force consistent with neck injury.

STEP 1: X-ray high risk patients.

The rule recommends that an x-ray should be obtained in all 'high risk' patients. X-ray **is indicated** if the patient meets **any** of these high risk criteria:

- Age \geq 65 years
- Dangerous mechanism of injury*
- Presence of parathesiae in the extremities.

* Dangerous mechanism: Fall from \geq 1 metre **or** axial load to head eg: diving **or** motor vehicle crash at high speed (100km/hr) **or** rollover or ejection **or** motorized recreational vehicle **or** bicycle collision.

STEP 2: If there are no high risk criteria found in step one, then a single 'low risk' factor allows safe assessment of the range of motion.

These include **any** of:

- Simple rear-end motor vehicle crash[#]
- Sitting position in the emergency department
- Ambulatory at any time
- Delayed onset of neck pain
- Absence of mid-line C-spine tenderness.

X-ray is indicated if the patient **does not meet any** of these safety criteria.

[#] Simple rear end motor vehicle crash excludes: pushed into oncoming traffic **or** hit by bus/large truck **or** rollover **or** hit by high speed vehicle.

STEP 3: Test range of motion.

Should the patient then be **able to actively rotate their neck 45° left to right then no x-ray is indicated.**



4 Stiehl IG et al (1997) Variation in emergency department use of cervical spine radiography for alert, stable trauma patients. *CMAJ* 156:1537–1544

5 Morris CG, McCoy EP, Lavery GG (2004) Spinal immobilisation for unconscious patients with multiple injuries. *Br Med J* 329 :495–499

6 Kerr D, Bradshaw L, Kelly AM (2005) Implementation of the Canadian C-spine rule reduces cervical spine x-ray rate for alert patients with potential neck injury. *J Emerg Med* 28:127–131

7 Chu K (2004) Reducing the inappropriate use of cervical spine x-rays in alert and stable blunt trauma patients (abstract). Available at: <http://www.nicsl.com.au/projects>. Accessed Sept, 2005

1 Hoffman JR et al (2000) Validity of a set of clinical criteria to rule out injury to the cervical spine in patients with blunt trauma. *N Engl J Med* 343:94–99

2 Stiehl IG et al (2001) The Canadian C-spine rule for radiography in alert and stable trauma patients. *JAMA* 286:1841–1848

3 Stiehl IG et al (2003) The Canadian C-spine rule versus the NEXUS low-risk criteria in patients with trauma. *N Engl J Med* 349: 2510–2518