An audit of cervical spine imaging in alert and stable trauma patients

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Background

The Canadian C-Spine Rule was developed from a prospective cohort of alert stable patients with head or neck trauma presenting to 10 Canadian Emergency Departments (ED)s between 1996 and 1999 (n= 8924) in response to wide variation between ED physicians in the ordering of C-spine X-rays in alert stable patients with head/neck trauma.

These ‘rules’ has been prospectively validated in a large multi-centre trial (n=7017) with sensitivity 99.3% (95% CI 96-100) and specificity 40.4%. The sensitivity and specificity in detecting clinically important C-spine injury have been shown to be superior to the previously derived National Emergency X-Radiography Utilization Study Low Risk Criteria (NEXUS) by a prospective study by Stiell et al (n=8293). Clinically important cervical-spine injury was defined as any fracture, dislocation, or ligamentous instability demonstrated by imaging. All injuries were considered clinically important unless radiography demonstrated one of the following isolated clinically unimportant fractures: osteophyte avulsion, a transverse process not involving a facet joint, a spinous process not involving lamina, or simple vertebral compression of less than 25 percent of body height.

Aim

To compare assessment and cervical spine radiography in alert stable patients with head/neck trauma presenting to Whittington Hospital Emergency Department, to Canadian C-spine rules for radiography

Criteria

Process:

1. Patients should be risk stratified according to history and examination
2. Assessment of ROM in low risk group if safe (sitting position/ambulatory at any time/delayed onset neck pain/no midline C-spine tenderness)
3. Range of movement of C-spine should be documented
4. The risk stratification and X-ray result should be recorded in the notes
Outcome:

1. No C-spine imaging for patients in low risk group with full range of movement
2. C-spine X-ray for patients in high risk group
3. C-spine X-ray for patients in low risk group and decreased range of movement

Ideal standard:

Target level 100%

A summary of Canadian C-spine rules

Population

Adults presenting to ED with blunt trauma to head/neck with stable vital signs and GCS 15. For the purposes of the Canadian study, blunt head or neck trauma is evidenced by neck pain, visible injury above the clavicles, a dangerous mechanism for neck injury or non ambulatory patients. Stable vital signs are defined as a systolic blood pressure over 90mmHg and respiratory rate between 10 and 24 breaths per minute.

Exclusions criteria:
- Patients under 16
- Injury > 48 hours previously
- Penetrating trauma
- Acute paralysis
- Known vertebral disease
- Pregnant females

Risk stratification of patients

HIGH RISK GROUP
1) Age over 65 years
2) Dangerous mechanism
   - fall from over 1m or stairs
   - axial load to head
   - MVC at high speed > 62mph/ rollover/ ejection
   - Motorized Recreational Vehicles
   - Bicycle collision
3) Paraesthesia in Extremities

All patients in the high risk group warrant imaging of the cervical spine to look for acute bony injury.

LOW RISK GROUP
- simple rear end MVC
- sitting position in ED
- ambulatory at any time
- delayed onset neck pain
- absence of midline C-spine tenderness

Patients with any low risk factor and no high risk factor, should have the range of movement at the cervical spine assessed clinically. C-spine X-ray is indicated if the patient has less than 45 degrees rotation to each side. Patients with a full range of movement at the C-spine do not warrant imaging.

Methods

Our team used the triage information on the EDIS system to identify patients with neck pain/ head injury/ method of trauma e.g. road traffic accident or fall over a 3 week period starting in November 2006. Exclusion criteria were applied at this stage from the available data. We retrieved both the letter to the patient’s GP on the computer system and the paper records stored in the ED. These were read and the collected data entered into a questionnaire.

The investigations section on EDIS was used to identify patients who had had an X-ray requested, in addition to the notes. The formal X-ray report was then checked on the Radiology system.

All ED physicians present at this time had a minimum of 3 months experience of emergency medicine. Most of the junior staff had already had both teaching on clinical assessment of cervical spine injury after trauma and radiology training within the Whittington Hospital at this point in time. Data collection was standardised and a questionnaire format was used to facilitate this.

Results

We identified 36 alert and stable patients who had experienced neck trauma over a 3 week period. 5 of these were excluded: 4 on the basis of exclusion criteria and case notes were not found for 1 patient.

Eight patients were stratified as high risk for clinically significant C-spine injury according to the Canadian C-spine rule criteria. Of these, five patients had cervical spine imaging. One was reported by the ED physician as fractured C2 vertebra, and three were reported as normal. Neither the C-spine X-ray request nor the result was documented in the notes for the fifth patient. All 8 high risk patients should have had C-spine imaging. Of the five imaged patients there was no acute bony injury identified.

4 of these radiographs had a formal report on the Radiology system: no bony injury was seen on these films. In addition, none of the films were adequate views of the C-spine. 3 radiographs showed C1 to 7 only and 1 showed just C1 to 6. 22 patients were stratified as low risk for clinically significant C-spine injury. Range of movement at the C-spine was documented in the notes for 12 patients, of these, 2 had a decreased range of movement. One patient had imaging with no fracture reported and the other was not imaged. No cases of inappropriate cervical spine imaging were identified within the low risk group. No acute bony injury was identified in any of the 6 patients who underwent imaging.
It was noted during review of the formal X-ray reports that none of the views obtained were adequate to assess for clinically significant C-spine injury. Most views showed C1 to C7 only; one showed C1 to C6. This was not documented in the notes, and none of the radiographs were repeated. This indicates that the physician viewing the radiograph in each case was not aware of the inadequate film.

10 ED senior house officers/ foundation year 2 trainees and middle grades were asked about the C-spine rules during a randomly selected shift. Although three were aware they existed, just one knew the algorithm and used it.

Poor documentation in the notes may be due to time pressures in the ED, with the current 4 hour targets and lack of awareness of prospectively validated clinical guidelines for this topic.

Conclusion

The data show that the current clinical practice in the ED at the Whittington Hospital does not follow the Canadian C-spine rules.

Recommendations for change

Based on our findings, we would recommend:
1. increased education of ED physicians regarding the Canadian C-spine rules during teaching sessions
2. improved documentation of examination findings, particularly the mobility of the patient when seen in the ED, and radiograph findings. This has significant medico-legal implications.
3. an increased emphasis of the importance of adequate C-spine views- to both requesting physicians and radiographers. Both requesting physician and the radiographer have both a duty of care and a legal obligation to justify exposure of a patient to ionising radiation.
4. the incorporation of Canadian C-spine criteria into the Head Injury proforma currently used in the department to encourage appropriate assessment and documentation of this subset of neck trauma patients.
5. the completion of the audit cycle. We would recommend re-audit of this topic in the next 3-6 months to see if these measures have improved our adherence to the Canadian cervical spine imaging guidelines.

References