

Clinical Decision Rule for C-Spine Clearance in the Netherlands, a National Survey

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Abstract

Introduction: Although validated clinical decision rules exist to clear the cervical spine (C-spine) after blunt trauma it seems that no uniform policy is used in Dutch Emergency Departments. In this national problem-analysis we assessed factors that could hinder implementation of these decision rules and whether there was interest in developing a national guideline to clear the C-spine.

Methods: During an expert-meeting a questionnaire was developed. This questionnaire was sent to all members of the Dutch societies of Radiology, Traumatology and Emergency Physicians. Completion of the questionnaire occurred anonymous and was based on goodwill.

Results: From the 222 respondents 55% used the ATLS guidelines for clearing the C-spine. In total, 7% used a combination of clinical decision rules and 5% did not use any criteria. 98% was willing to accept a national guideline. Main demands were that the future clinical decision rule had to be evidence-based and practical for daily use. In 33% the NEXUS criteria were suggested for implementation and in 31% the criteria within the ATLS guidelines. Factors suggested to hinder implementation of clinical decision rules were mostly related to the complexity of the decision rules, the trauma team leader's experience and the level of cooperation within the trauma team.

Conclusion: There is no uniform policy on how to clear the C-spine after blunt trauma in Dutch Emergency Departments. This problem analysis showed that there is general interest in a national guideline dictating one simple and validated clinical decision rule. A strategy will be developed to implement such a clinical decision rule with specific attention to overcome the aforementioned potentially hindering factors.

Keywords: Trauma; C-spine clearance; Clinical decision rule; Implementation; National guideline

Introduction

Yearly approximately 990.000 patients visit a Dutch Emergency Department (ED), of whom 2-6% has suffered from a blunt trauma to the cervical spine (C-spine) [1-3]. Prolonged spinal immobilization itself can cause severe side effects, such as pain, pressure sores and deterioration of neurologic function [4-8]. However, missed C-spine injuries lead to severe (neurologic) morbidity and mortality [9-13]. Therefore, it is important to either 'clear the C-spine' (i.e. no injury is present), or to diagnose any C-Spine Injuries (CSI), both fast and accurate. This can be achieved by the use of clinical decision rules or with the help of adequate diagnostic imaging.

Two large, prospective studies were performed for developing decision rules based on simple and clinically useful criteria that rule out significant CSI after blunt trauma in awake and alert patients.

The NEXUS study used 5 criteria to define a low probability of injury; no posterior midline cervical-spine tenderness, no evidence of intoxication, a normal level of alertness, no focal neurologic deficit and no painful, distracting injuries (the NEXUS criteria) See Table 1. If patients meet all the criteria the cervical spine can be cleared on clinical grounds without radiography [14].

The Canadian C-spine Rule (CCR) study defined 3 high-risk and 5 low-risk criteria [15]. See Figure 1 for the flowchart of the CCR criteria. If all the high-risk criteria are absent and one or more of the low-risk criteria is present it is assumed safe to assess the range of motion of the neck. If the patient can actively rotate his neck without pain no radiography is indicated and the cervical spine can be cleared. If one of the high-risk criteria is present, all of the low-risk criteria are absent

or rotation of the neck is painful, radiographical imaging is indicated. With the use of these clinical decision rules the C-spine could be cleared in approximately 13% of all blunt trauma patients without further imaging.

In 2009 the Dutch Institute for Healthcare Improvement (CBO) developed a national guideline with the advice to clear the C-spine based on clinical examination in Dutch Emergency Departments [16]. In this guideline the two above mentioned clinical decision rules are described. In addition, the CBO guideline also mentions the clinical criteria as described in the worldwide accepted 'Advanced Trauma Life Support' (ATLS) guideline [17]. These ATLS' criteria are based on the NEXUS criteria and differ only on the 'distracting injuries'

no midline cervical tenderness
no focal neurologic deficit
normal alertness
no intoxication
no painful, distracting injury

Table 1: NEXUS criteria.

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criterion which is absent in the ATLS' decision rule. Although the CBO guideline describes these clinical decision rules in detail they do not recommend the specific use of one of these decision rules. Within the guideline author group the general impression was that the existing clinical decision rules generally were not or incorrectly used resulting in too many radiological examinations. A telephonic survey by the authors of the present study amongst 20 physicians, working directly in the Emergency Department and who regularly evaluate trauma patients with potential CSI's, confirmed this impression.

In this study we assessed the current application of decision rules to clear the C-spine on clinical grounds in Dutch ED's and the interest to implement a national guideline dictating one decision rule. Second, we assessed factors that could potentially hinder the implementation of such a clinical decision rule.

Methods

For this problem analysis we developed an online, semi-structured questionnaire. Factors that could potentially hinder the implementation of a clinical decision rule were listed during a meeting with ten field experts (trauma surgeons, emergency physicians and radiologists). Amongst the experts all levels of trauma care and all disciplines directly involved in initial trauma evaluation were present. The experts were chosen for their interest in this topic.

After listing the potential hindering factors the questionnaire was developed and judged by a focus group on clear questioning and completeness. Several general questions were added to analyze local situations with regard to hospital's patient flow and decision rule usage. In addition, questions were added to assess the general interest in implementation of a national guideline. The focus group consisted of 20 residents or staff members from departments of trauma surgery, radiology or emergency care.

In accordance with their comments the final questionnaire was shortened till 35 questions about hindering factors and 7 general questions. Both the expert panel's and the focus group's cooperation was based on goodwill.

In the beginning of 2010 the online questionnaire was sent to the members of the Dutch scientific societies of Radiology, Trauma surgery, and Emergency Physicians. Only questionnaires that were filled in completely were used for analysis. Completion of the questionnaires occurred anonymous and was voluntary. Answers to the questions on potential hindering factors could be classified in to five levels (full disagreement; moderate disagreement; no agreement, no disagreement; moderate agreement; full agreement). To calculate the most hindering factors each answer was assigned a score (1-5). The most hindering factors were the answers with the highest scores. All data collection and analyses were performed in SPSS 15.0.1 (SPSS, Inc., Chicago, IL).

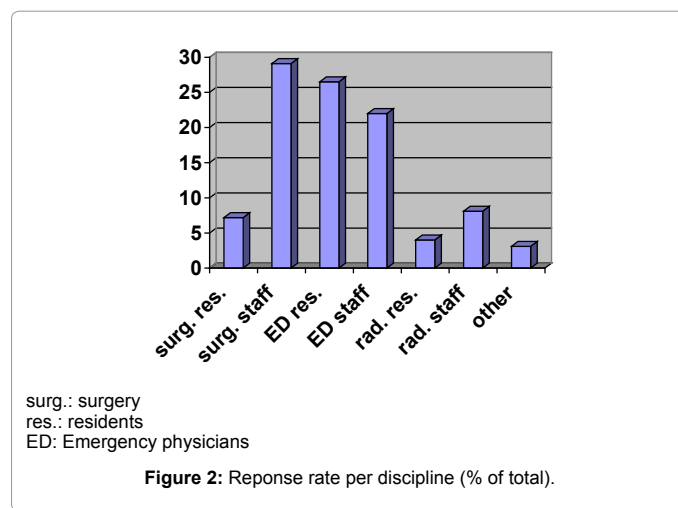
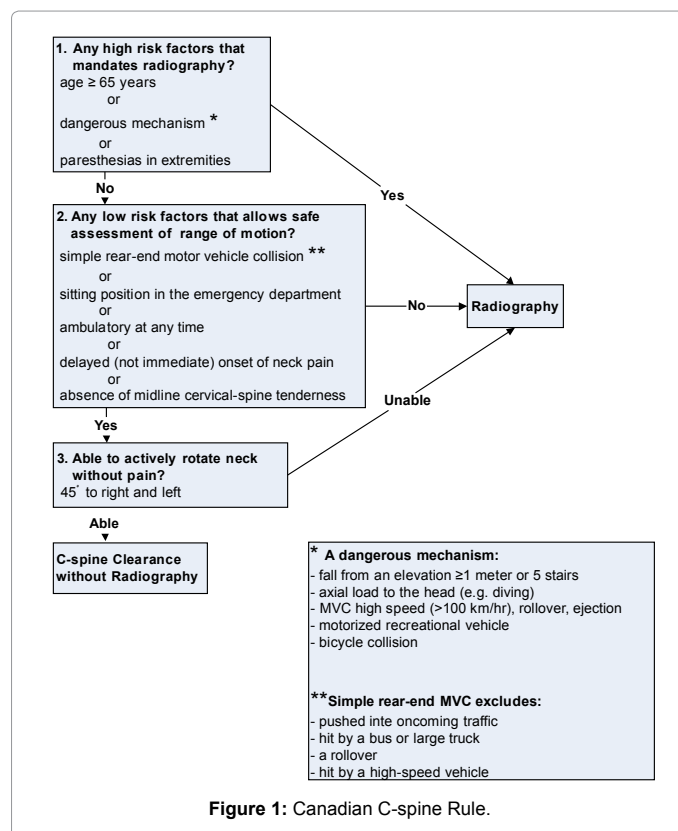
Results

In total, 222 respondents filled in the questionnaire completely, respectively 79/560 (trauma) surgeons (14%), 109/600 emergency physicians (18%) and 27/1650 radiologists (0.02%). Within the group of 'others' (n=7) anesthesiologists, intensivists and orthopedic surgeons who were members of one of the previously described scientific societies completed the questionnaire. Figure 2 shows the percentage of respondents classified according to their disciplines. From the respondents 19% worked in an academic center, 63% in teaching hospitals and 18% in non-teaching hospitals. The times that

the respondents evaluated patients with potential C-spine injury in their clinic ranged from once per two weeks until twenty times a week.

Figure 3 shows an overview of the clinical decision rules that were used at the time of completing the questionnaire. In 7% of the respondents a combination of the above mentioned clinical decision rules was used to clear the C-spine, and 5% did not use any clinical decision rule.

In general, there was interest in development and implementation of a national guideline (98%). Main requirements were that the proposed decision rule is evidence based and practical in daily use such as the NEXUS criteria (33%) or the criteria as described in the ATLS guidelines (31%). The CCR was suggested for implementation by 21%.



However, most of the respondents considered this decision rule too complex for daily use in comparison with the two aforementioned decision rules.

Table 2 shows the ten factors that were suggested by the respondents as most hindering the implementation of a decision rule. These factors were mostly related to the trauma team leader's experience and the level of cooperation within the trauma team, and the complexity of the decision rules. In addition, a previous experience with missing an injury despite adequate use of the decision rule was also suggested to hinder implementation although the legal consequences were not considered to be potentially hindering.

Discussion

In this national problem analysis we assessed the current national application of and interest in implementation of clinical decision rules to clear the C-spine after blunt trauma by using an online questionnaire. The questionnaire showed that there is general interest in a national guideline using one clinical decision rule. Respondents want the future decision rule to be simple with clearly formulated criteria and thus practical for daily use. Both the NEXUS and ATLS criteria were often mentioned as the decision rule of choice for implementation.

Both the NEXUS and the CCR study are evaluated in large and well designed studies and showed similar results. In the NEXUS study all 34.069 patients were evaluated with diagnostic imaging and with this decision rule only one significant injury was missed. In addition, 818 patients had a fracture (2.4%) and the specificity was 12.6% [14]. With the CCR criteria all 151 significant cervical spine injuries (1.7%) were diagnosed of the 8.924 enrolled patients without missed injuries. The specificity was 42.5%. Of all included patients 31% had no radiological imaging according to the criteria but were reviewed at two weeks

follow-up [15]. One study compared both decision rules in a group of 8.283 patients but the methodology of this comparative study was criticized by several authors [18]. Main reason for the criticism was the method of applying the criteria of both decision rules, the included study population (i.e. age and level of consciousness) and the choice of study sites, respectively the same hospitals where they already introduced the CCR. Therefore, the general conclusion is that none of the decision rules is superior to the other.

As mentioned before the NEXUS and ATLS criteria only differ on the 'distracting injury' criterion. However, one study showed that when one randomly chosen criterion of the NEXUS decision rule is omitted the sensitivity and negative predictive value of the prediction rule is decreased. Therefore adaptation of the existing guidelines will result in an increased chance on missed injuries or unnecessary radiological imaging [19]. Because the ATLS criteria are equal except for the 'distracting injury' the chance of a missed injury is increased. Because the CCR is more complex than the NEXUS criteria and the results of the questionnaire show general support for the NEXUS (and related ATLS criteria) it is most logic to implement the NEXUS criteria as the final clinical decision rule.

Third aim of this study was to assess potential hindering factors for implementation of a national guideline with one clinical decision rule. The factors forthcoming from the questionnaire that could potentially hinder implementation clinical decision rules were associated with the constitution and experience of the trauma team (clinical experience of the person applying the decision rule and from which specialism the trauma team leader originated). Furthermore, the complexity of the decision rule was also mentioned as an important hindering factor. To overcome the first problem clear and practical protocols should be developed and introduced in ED's. In this way the protocol is clear for all physicians who deal with this problem and possibilities for debate are reduced. To minimize the problem with the complexity of the decision rule a simple, existing decision rule has to be appointed for implementation which preferably is already used in a large proportion of the ED's.

An interesting finding was that some hospitals did not have any protocol for clearing the C-spine or used a combination of several decision rules. Because adaptation of existing decision rules or not using them at all increase the chance of missed injuries with potential severe morbidity or lethal consequences we strongly advise to use one of the abovementioned validated clinical decision rules. In addition, another disadvantage of adaptation of existing decision rules is increased radiographic clearance of the C-spine which results in unnecessary high radiation exposure and costs.

The current questionnaire did have several limitations. With the web-based questionnaire we have tried to detect all potential hindering factors in all levels of trauma care. This was the reason to select the expert panel and focus group specifically from hospitals with different levels of trauma care and a wide variance in clinical experience. However, the completion of the questionnaire was web-based, voluntary and anonymous. This could have resulted in the fact that only physicians with specific interest and experience in this topic have completed the questionnaire and not the physicians who do not often encounter this problem. This could have influenced the results because this is also the group that probably has more knowledge on this topic. As a result potential other hindering factors could have been under estimated.

Another problem occurring with the application of an anonymous and voluntary questionnaire is that the response rate can hardly be influenced. Although the absolute number of respondents (n=222) is

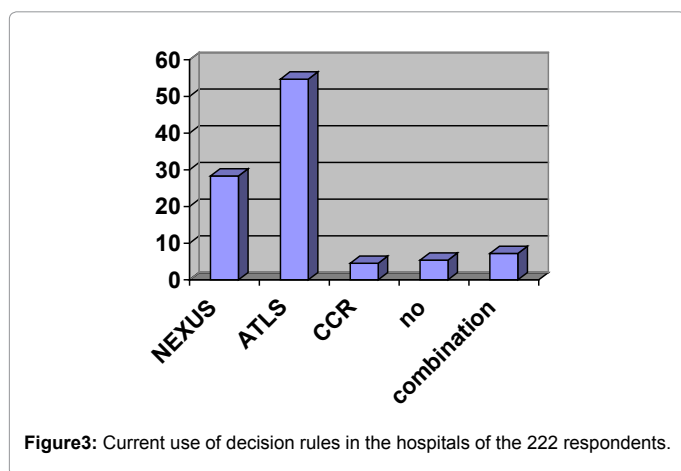


Figure 3: Current use of decision rules in the hospitals of the 222 respondents.

1. unclear definitions within the criteria
2. use of different decision rules by different specialists
3. unfamiliarity with all criteria of the used decision rule in own hospital
4. level of experience of the trauma team leader
5. complexity of the decision rule
6. person using the decision rule (trauma team leader or junior resident)
7. previous experience with missing an injury after correct use of the decision rule
8. availability and practicability of protocols
9. composition of the trauma team
10. unfamiliarity with the principles on which the decision rule is based

Table 2: Ten most mentioned hindering factors for the implementation of clinical decision rules to clear the C-spine. (In sequence of highest score).

considerable, the overall response rate was disappointing when taking the absolute amount of members from the different Societies into account. Despite sending the members a reminder this did not result in a desired increase of the total respondents. Furthermore, although we considered excluding the radiology responses, to improve overall response rate, we decided not to do so because in some (higher level) Dutch trauma centers they are directly involved in trauma care.

The questionnaire design also resulted in the fact that we could not assess from how many different hospitals we received data. Based on the proportion of academic centers, teaching and non-teaching hospitals we concluded that this questionnaire did provide a representative overview of the general practice and opinion in Dutch ED's.

The last methodological issue that can be discussed could be the decision to have only radiologists, emergency physicians and (trauma) surgeons completing the questionnaire. The reason for this was to make a broad and multidisciplinary inventory to create nationwide support for the implementation of a guideline. Especially the group of emergency physicians is a developing specialty in Dutch hospitals which will be often involved with C-spine clearance. Although it could be questioned that the outcomes may have been different if other disciplines (orthopedics, anesthesiologists, ED nurses, etc.) would have been included, we feel that using our current population, most important issues were identified.

Subsequent to this study, a national, multidisciplinary guideline will be developed for general implementation in Dutch ED's. Currently several implementation strategies are being developed to assess which strategy will be most cost-effective for the future national implementation.

Conclusion

There is no uniform policy with respect to clinical decision rules on how to clear the C-spine after blunt trauma in Dutch Emergency Departments. This problem analysis showed that there is general interest in implementation of a national guideline dictating one simple and validated clinical decision rule. Most mentioned potential hindering factors for the implementation were related to the experience of the physician using the decision rules and the complexity and the practical use of the decision rule itself.

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