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## Introduction

The National Emergency X-Radiography Utilization Study (NEXUS) criteria is the most widely utilized cervical-spine (c-spine) imaging guideline at our institution. This tool reaches a sensitivity approaching 100% but has a specificity of nearly 12.9%.<sup>1</sup> A considerable factor for its low specificity is that the NEXUS criteria indicates c-spine imaging in all intoxicated trauma patients. Inclusion of intoxication as a criteria has been called into question in major studies and has been presumed to affect its accuracy and reproducibility.<sup>1</sup> With these considerations, utilization of the NEXUS criteria can lead to potentially worse patient outcomes and to over-utilization of computed tomography (CT) imaging.

Intoxicated patients comprise nearly half of all trauma patients; however, many studies do not focus on the clinical findings of c-spine injuries in this population. Research in this area has found that current guidelines have diminished sensitivity in intoxicated trauma patients with even minor head injuries.<sup>2</sup> Furthermore, healthcare providers may deem clinical assessment as unreliable with current guidelines due to difficulty with mental status assessment. For these reasons, multiple studies have called for better clinical assessment of c-spine injuries in intoxicated trauma patients in determining the need for imaging.<sup>2,3</sup> Honing decision-making in this population can hasten care, decrease mortality rates, lower healthcare costs, and prevent the various risks of prolonged immobilization, such as aspiration, pneumonia, and deep venous thrombosis.

In this study, we explored demographics, protective devices, and clinical findings of intoxicated patients involved in motor vehicle collisions (MVCs), the most common cause of c-spine injuries in the United States. Clinical findings of those with CT imaging-confirmed c-spine injuries, notably fractures, were compared to those with normal imaging.

## Methods

A retrospective chart review was performed on 485 intoxicated adult trauma patients involved in MVCs presenting at a Level I trauma center from March 2020 to September 2021. Patients were included in the study if they met the criteria of having a suspected c-spine injury, were intoxicated with any substance, and received CT scans. The CT scans served to confirm the presence or absence of c-spine fractures. Patients were divided into two groups based on CT imaging results: those with c-spine fractures and those without. Variables of interest included sex, age, race, type of intoxicating substance, protective devices used, and Injury Severity Score (ISS). These variables were analyzed between the two groups using univariate and multivariate analyses.

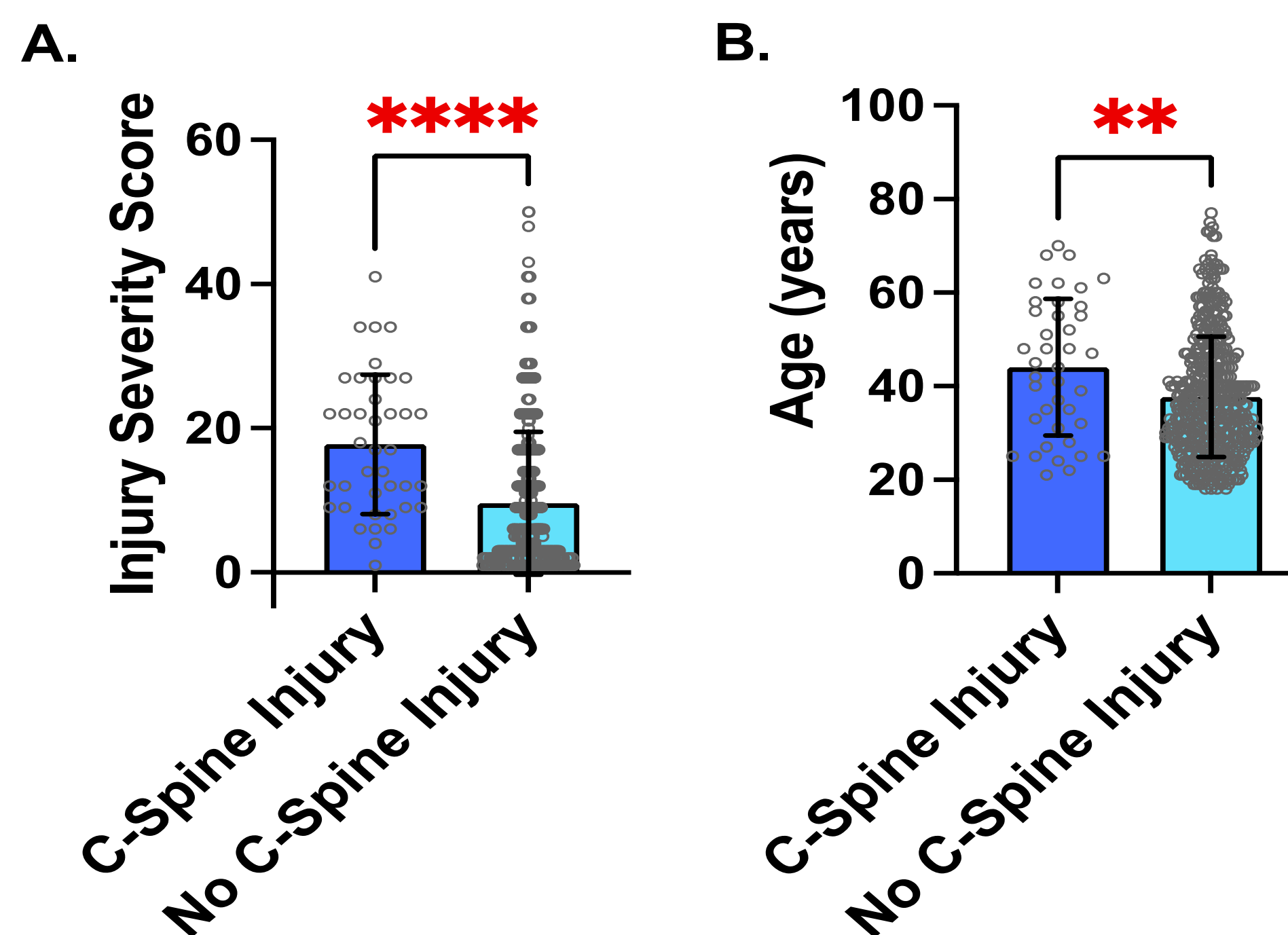


Figure 1. Univariate Analyses of Injury Severity Score (ISS) and Age (years) in Intoxicated Trauma Patients with or without C-Spine Injuries. Significance is indicated as follows: \*\*p<0.01, \*\*\*\*p<0.0001. A. Injury Severity Score (ISS); B. Age (years).

	Intoxicated + No C-Spine Injuries (n = 445)	Intoxicated + C-Spine Injuries (n = 40)	p-value
<b>Sex, n (%)</b>			
Male	309 (69%)	30 (75%)	0.6
Female	136 (31%)	10 (25%)	0.6
<b>Age, n (%)</b>			
<25	68 (15%)	3 (8%)	0.2
25-44	258 (58%)	17 (43%)	0.07
45-64	100 (22%)	17 (43%)	<b>0.007**</b>
65+	19 (4%)	3 (8%)	0.4
<b>Race, n (%)</b>			
Asian	2 (0.4%)	1 (3%)	0.2
Black	261 (59%)	24 (60%)	>0.9
White	176 (40%)	13 (33%)	0.4
Other	46 (10%)	2 (5%)	0.4
<b>Intoxicating Substance, n (%)</b>			
Alcohol	385 (87%)	32 (80%)	0.2
Other Drug	44 (10%)	3 (8%)	0.8
Both	16 (4%)	5 (13%)	<b>0.02*</b>
<b>Protective Devices, n (%)</b>			
Lap belt	193 (43%)	9 (23%)	<b>0.01*</b>
Shoulder belt	182 (41%)	8 (20%)	<b>0.01*</b>
Airbag	216 (49%)	21 (53%)	0.7
All Three	123 (28%)	4 (10%)	<b>0.01*</b>
None	116 (26%)	7 (18%)	0.3
<b>ISS, n (%)</b>			
1-8	255 (57%)	7 (18%)	<b>&lt;0.0001****</b>
9-15	88 (20%)	12 (30%)	0.1
16-24	60 (13%)	11 (28%)	<b>0.03*</b>
25-49	40 (9%)	10 (25%)	<b>0.004**</b>
50-74	2 (0.4%)	0 (0%)	>0.9
75+	0 (0%)	0 (0%)	>0.9

Table 1. Univariate Analyses of Sex, Age, Race, Intoxicating Substance, Protective Devices, and Injury Severity Score (ISS) in Intoxicated Trauma Patients with or without C-Spine Injuries. Significance is indicated as follows: \*p<0.05, \*\*p<0.01, \*\*\*\*p<0.0001.

## Results

Of the 485 patients, 8% (N=40) had c-spine fractures confirmed with CT imaging.

As depicted in Figure 1, patients between the ages of 45-64 years (p=0.007) or with an ISS between 16-49 (p≤0.03) were most associated with having c-spine injuries. Table 1 indicates that an ISS between 1 and 8 was most strongly associated with having no c-spine injury (p<0.0001). The use of alcohol or other drugs did not show a relation with c-spine injuries; however, the use of alcohol with another drug was correlated with c-spine injuries (p<0.02). While airbag deployment was similar between groups (p=0.7), the use of a lap belt, shoulder belt, or all three protective devices was associated with having no c-spine injuries (p<0.01). Sex and race were similar among the groups.

On multivariate analysis, ISS (OR 1.07, 95% CI 1.04-1.10, p<0.001) and age (OR 1.04, 95% CI 1.01-1.06, p=0.003) were the greatest predictors of injuries.

## Conclusions

- Intoxicated trauma patients were most at-risk for c-spine injuries if they were between the ages of 45-64 years or had an ISS between 16-49.
- Further analysis of age and ISS may be able to refine c-spine imaging guidelines for intoxicated patients after motor vehicle trauma.

## Refinements

- Include more patients over 65 years of age to gain more power with conclusions.
- Encompass more variables noted in other studies, such as presence of headache & loss of consciousness.<sup>2</sup>
- Perform a more detailed analysis on mechanism of injury, such as speed on impact, ejection from vehicle, & damage to vehicle, may be of further exploratory efforts.

## References

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