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*AJNR Am J Neuroradiol* published online 3 October 2024
http://www.ajnr.org/content/early/2024/10/03/ajnr.A8416

Published October 3, 2024 as 10.3174/ajnr.A8416

ORIGINAL RESEARCH
EMERGENCY NEURORADIOLOGY

# Differences in Cervical Spine Fractures in Patients Younger or Older Than 65 Years of Age: Implications for the Canadian C-Spine Rule

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## ABSTRACT

**BACKGROUND AND PURPOSE:** There has been a distinction made in the 2001 Canadian C-Spine Rule regarding patients 65 and older and younger than 65 years of age as far as indications for cervical spine CT scanning. We sought to determine if there are differences in the symptoms, mechanisms of injury, fracture locations, and types that are still relevant in 2024.

**MATERIALS AND METHODS:** The institutional review board approved this retrospective study of cervical spine CT emergency department results from 2 hospitals in our health system after reviewing 5 years of data in patients experiencing trauma. In addition to the primary variable of age (younger than 65 years and 65 years and older), we looked at injury mechanism, fracture types, sites, symptoms, and operative or medical treatments. Because the demographics of our home site is different from most towns in the United States, we provide race/ethnicity data.

**RESULTS:** Of 21,986 cervical spine CTs, 190/9455 (2.0%) participants 65 years of age and older and 199/12,531 (1.6%) participants younger than 65 years of age had fractures (total, 389/21,986, 1.8%). There were more cases of falls from standing (106, 55.8%) and falls from a height (46, 4.2%) in those 65 years and older and this mechanism was associated with a higher risk of C1 and C2 fractures (52, 27.4%; and 78, 41.1%, respectively). Among the C1 fractures, anterior and posterior arch fractures predominated (37, 19.5%). For C2 fractures, types 2 and 3 odontoid fractures (39, 20.5%; and 12, 6.3%) were more common in the older cohort. Motor vehicle collisions were more common in the younger cohort (89, 44.7%), and they were associated with more C5–C7 fractures (47, 23.6%; 60, 30.2%; and 66, 33.2%, respectively) including the facets (49, 24.6%), spinous processes (31, 15.6%), and transverse processes (52, 26.1%). Overall, the rates of instability, surgical intervention, and asymptomatic fractures were similar in the 2 age groups.

**CONCLUSIONS:** Cervical spine fractures appear in about 1.8% of the CT scans performed in a busy emergency department environment. Fractures in the elderly occur more commonly due to falls, are located at C1 and C2, and may involve ligamentous injuries. Younger patients incur trauma more commonly due to motor vehicle collisions, and they are more likely to affect the posterior elements, especially C5–C7. The differences in trends for fractures in the 65 years of age and older and younger than 65 years of age groups have persisted since the Canadian C-Spine Rule 1996–1998 data were collected.

**ABBREVIATIONS:** CCR = Canadian C-Spine Rule; CSCT = cervical spine CT; ED = emergency department; MVC = motor vehicle collision

The Canadian C-Spine Rule (CCR) serves as a practical guide for determining the necessity of radiography in posttrauma patients. This rule encompasses 3 high-risk criteria, any one of which justifies imaging, and directly specifies that individuals 65 years of age or older, regardless of signs and symptoms and mechanism of injury, should undergo cervical spine CT (CSCT) evaluation. The CCR rule implies that individuals aged 65 and older may have unique risk factors or considerations that warrant separate attention in the assessment process when they arrive at the emergency department (ED). Additionally, the types of fractures seen in this age group, based 1996–1998 data used to construct the CCR, are different from those in the younger cohort.

EDs across the United States are experiencing a notable influx of patients seeking care for injuries, totaling a staggering 140 million visits in 2021.[1] Among ED visits in 2017, falls emerged as the leading cause, accounting for 32.6% of the total injury-related ED visits.[2] This statistic underscores the pervasive impact of falls on public health and safety. Notably, while falls were the

Received May 15, 2024; accepted after revision June 28.

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http://dx.doi.org/10.3174/ajnr.A8416

## SUMMARY

**PREVIOUS LITERATURE:** The Canadian C-Spine Rule defined dangerous and nondangerous mechanisms of injury and identified different patterns of cervical spine injuries in different patient populations. Injury patterns in the elderly differ from those of younger patients because of differences in injury mechanisms, bone density, and the presence of degenerative changes affecting biomechanics. The center of the axis of rotation for flexion and extension within the cervical spine is located at levels C5-C6, but as people age, the range of motion of the cervical spine decreases. Due to these biomechanical changes, the axis of the flexion-extension center shifts to C1-C2 in the elderly.

**KEY FINDINGS:** We found fractures rates of 2.0% in individuals 65 years of age and older and 1.6% in those younger than 65 years of age. The elderly had more fractures at C1 and C2, usually secondary to falls. Younger patients had more frequent fractures at C5–C7, often from motor vehicle collisions and falls from heights.

**KNOWLEDGE ADVANCEMENT:** Understanding different patterns of injury in variable age groups can help radiologists focus attention on the more common locations of injuries and thereby avoid detection errors. The trends, upper cervical spine fractures in the elderly and lower cervical spine fractures in young patients, have been stable across time.


predominant mechanism of injury among individuals aged 65 and older, younger patients face a different set of risks, with motor vehicle collisions (MVCs) and incidents involving being struck by objects taking precedence. Understanding these variations in injury patterns is crucial for targeted prevention strategies and improved health care delivery across different age groups.[2]

As individuals age, they become increasingly susceptible to falls, largely due to factors such as compromised balance and diminished bone strength. Among the array of injuries that can result from such falls, cervical spine injuries are distinct, constituting approximately 3.5% of global trauma cases treated in EDs.[3]

We sought to determine whether, in 2024, the symptoms, fracture types, fracture levels, or mechanisms of injury of traumatized patients described in the original CCR cohort show differences in patients younger or older than 65 years. We surmised that because people are living longer and are healthier,[4-7] they may show changes in fracture types and mechanisms.

## MATERIALS AND METHODS

The study was approved by Johns Hopkins University School of Medicine institutional review board as an exempt retrospective chart review study. Due to the retrospective nature of the study, informed consent was waived.

We retrieved reports of noncontrast CSCT images for all patients scanned at the 2 EDs of our health system from July 1, 2018, to June 30, 2023. Our EDs follow the CCR as a guide to ordering diagnostic imaging, usually CSCT. This retrieval from the PACS was precisely defined by the following specifications: 1) originating from the ED; 2) July 1, 2018, to June 30, 2023; and 3) CSCT. The output of the search provided the patients' medical record number, age and sex, and the impression of the CSCT report for each patient. The impressions of the CSCT report (and not the images of the studies) were retrospectively reviewed by members of the research team, with any disagreements settled by the senior author who has 30 years of neuroradiology experience.

The CSCT reports were reviewed for the presence of traumatic injuries to the cervical spine, separated into bone-versus-soft-tissue injuries. All ligamentous injuries or hemorrhagic collections in the canal mentioned in the CSCT report were confirmed by a contemporaneous cervical spine MRI.

We performed a random sample of 250 ED CSCT study indications to confirm that the search yielded cases predominantly due to trauma. Two hundred forty-seven (98.8%) cases were for trauma indications; one for persistent pain after cervical spine surgery, one for metastatic disease, and one for neck pain from spondylopathy.

The CSCT scans were obtained on a 64-section scanner (Siemens Somatom Plus) at 1-mm intervals with images reconstructed using both bone and soft-tissue algorithms. The interpretation was made on 1- to 3-mm axial images, and multiplanar reformatting was performed to better visualize the structures of interest. All studies were interpreted by fellowship-trained neuroradiologists at the time of the study. The following are the reports reviewed by the study team.

The electronic medical records in Epic Systems of all patients whose CSCT reports demonstrated fractures, ligamentous injuries, and/or spinal canal hemorrhage were reviewed to assess the patients' clinical symptoms, physical examination findings, and treatment of their injuries as well as basic demographic information of age and sex.

Patients' data were classified into the following categories:

1) Age
2) Sex
3) Acute fracture/ligamentous injury/blood in the canal or not
4) Level of fracture (C1–C7)
5) Portion of vertebra fracture (eg, pedicle, body, lamina, spinous process)
6) Asymptomatic with no history or physical examination findings suggestive of cervical spine injuries and capable of giving a reliable history (ie, not impaired, demented, unconscious, under the influence of alcohol or drugs) versus symptomatic
7) No treatment versus medical treatment (ie, collar) versus surgical treatment
8) Mechanism of injury divided by
   a) MVC (unrestrained or restrained)
   b) Assault
   c) Fall from a height
   d) Fall from ground level
   e) Found down
   f) Pedestrian hit
   g) Other

**FIG 1.** This type 2 odontoid fracture occurred in an 80-year-old patient after a fall down the stairs.

### *Statistical Analysis*

Statistical analysis was performed using SPSS Version 27 software (IBM). For each categoric variable, the $\chi^2$ or Fisher exact test was conducted to compare the distribution between the asymptomatic and symptomatic groups, as well as between patients younger than 65 years of age and those 65 years of age and older.

Additionally, we used binary logistic regression to adjust covariates, specifically mechanism, sex, and age. In these regressions, all significant outcomes that had a significant relation with age groups were considered dependent variables, and the other 3 important variables (age, sex, and mechanism of injury) were considered covariates. A significance level of $P < .05$ was considered statistically significant in our analysis.

Logistic regression was performed to assess the association of mechanisms of injury and cervical spine fracture types (fracture levels and fracture parts). Mechanism of injury was analyzed as a categoric variable, and the Bonferroni correction was used to compare the different groups. Analysis was performed using Stata software, Version 17 (StataCorp).

## RESULTS

### *65 years and Older Cohor*

There were 9455 unique ED cervical spine CT scans performed in patients 65 years of age or older during the 5-year period. These occurred in 7114 patients (3977, 55.9% women). One hundred ninety studies (2.0%) and patients (2.7%) showed cervical spine fractures in this age group. Of those 65 years and older with fractures, 37.9% had multiple levels of cervical spine fracture. C1 (52 fractures) and C2 (78 fractures) were the most common levels affected (Fig 1 and Table 1). The anterior and/or posterior arches of C1 were affected in 37 patients. Falls from either ground level (106/190 = 55.8%) or a height (46/190 = 24.2%) were the most common mechanism of injury (Table 2).

### *Younger Than 65 Years of Age Cohort*

There were 12,531 unique ED CSCT scans obtained in 10,371 patients younger than 65 years of age during a 5-year period (Table 1). One hundred ninety-nine (1.6%) studies in 199 patients (1.9% of patients) showed cervical spine fractures. Of the 199 patients, 46 (23.1%) patients were women and 19 (9.5%) were asymptomatic. Seventy-one (35.7%) patients had multilevel cervical spine injuries. C7 fractures were the most common, affecting 66 (33.2%) patients. The vertebral body (36.2%), transverse process (26.1%), and facet (24.6%) were most commonly injured (Fig 2). MVC was the most common mechanism of injury (89/199, 44.7%), followed by a fall from a height (37/199, 18.6%) (Table 2).

### *Comparison of Age Groups*

Location. More than one-half of the 65 and older participants with fractures were women (58.9%), but only 23.1% of those younger than 65 were women ($P < .001$) (Table 1). The older population (65 years and older) had a higher incidence of C1 (27.4% versus 16.1%; $P$ value = .007) and C2 (41.4% versus 21.1%; $P$ value < .001) fractures compared with participants younger than 65 years of age. Hence, there were more cases of fractures of the odontoid process among the older participants, often type II odontoid fracture (20.5% versus 3.5%; $P$ value < .001) and type III odontoid fracture (6.3% versus 1%; $P$ value = .005). However, the type I odontoid fracture rate was similar between the 2 age groups.

For the group younger than 65 years, fractures predominantly involved C5 (23.6% versus 13.2%; $P$ value = .008), C6 (30.2% versus 21.1%; $P$ value = .04), and C7 (33.2% versus 21.6%; $P$ value = .011), compared with the older population. Transverse process and facet fractures were more common in the younger group.

Mechanism. Participants in the younger age group had a higher incidence of motor vehicle collisions (44.7% versus 12.1%), assault (8.5% versus 0.5%), and being struck by a vehicle as a pedestrian (7.5% versus 1.1%) (Table 2). On the other hand, the older age group had a higher incidence of falls, including falls from a height (24.2% versus 18.6%) and falls from ground level (55.8% versus 12.6%).

Other. There was no difference in the rate of surgical treatment (15.4% versus 12.1%) between the 2 age groups. When comparing the 48 asymptomatic patients with the 341 symptomatic patients, none of the variables seen in Table 1 were different between the 2 groups across the 389 patients with fractures.

**Table 1: Distribution of factors in the 2 age groups[a]**

| Factor | Total Group (%) $n = 389$ | ≥ 65 Years Old (%) $n = 190$ | <65 Years of Age (%) $n = 199$ | *P* Value |
|---|---|---|---|---|
| Multiple levels fractured | 143 (36.8%) | 72 (37.9%) | 71 (35.7%) | .65 |
| C1 | 84 (21.6%) | 52 (27.4%) | 32 (16.1%) | .007 |
| C2 | 120 (30.8%) | 78 (41.1%) | 42 (21.1%) | <.001 |
| C3 | 48 (12.3%) | 27 (14.2%) | 21 (10.6%) | .27 |
| C4 | 45 (11.6%) | 17 (8.9%) | 28 (14.1%) | .11 |
| C5 | 72 (18.5%) | 25 (13.2%) | 47 (23.6%) | .008 |
| C6 | 100 (25.7%) | 40 (21.1%) | 60 (30.2%) | .040 |
| C7 | 107 (27.5%) | 41 (21.6%) | 66 (33.2%) | .011 |
| Body | 147 (37.8%) | 75 (39.5%) | 72 (36.2%) | .50 |
| Transverse process | 75 (19.3%) | 23 (12.1%) | 52 (26.1%) | <.001 |
| Spinous process | 57 (14.7%) | 26 (13.7%) | 31 (15.6%) | .59 |
| Lamina | 61 (15.7%) | 23 (12.1%) | 38 (19.1%) | .58 |
| Facet | 78 (20.1%) | 29 (15.3%) | 49 (24.6%) | .021 |
| Ant/post arch | 49 (12.6%) | 37 (19.5%) | 12 (6%) | <.001 |
| Odontoid I | 2 (0.5%) | 2 (1.1%) | 0 (0%) | .14 |
| Odontoid II | 46 (11.8%) | 39 (20.5%) | 7 (3.5%) | <.001 |
| Odontoid III | 14 (3.6%) | 12 (6.3%) | 2 (1%) | .005 |
| Pedicle | 36 (9.3%) | 14 (7.4%) | 22 (11.1%) | .21 |
| Ligamentous injury | 42 (10.8%) | 28 (14.7%) | 14 (7%) | .014 |
| Epidural hematoma | 15 (3.9%) | 11 (5.8%) | 4 (2%) | .053 |
| Women | 158 (40.6%) | 112 (58.9%) | 46 (23.1%) | <.001 |
| Surgical treatment | 53 (13.8%) | 29 (15.4%) | 24 (12.1%) | .366 |
| Asymptomatic | 48 (12.3%) | 29 (15.3%) | 19 (9.5%) | .09 |

**Note**:—Ant/post indicates anterior/posterior.

[a] Data are expressed as frequency (%). The *P* value was calculated by $\chi^2$ and Fisher exact tests. According to this table, C1 and C2 fractures had a significantly higher frequency in patients 65 years of age or older in contrast to the C5, C6, and C7, which had a higher frequency in patients younger than 64 years of age. Moreover, there was a significant relation of the transverse process, facet, ant/post arch, Odontoid II/III, ligamentous injury, and sex with age group (all, *P* values < .05).

**Table 2: Mechanism of injury by age group[a]**

| Mechanism of Injury | Total Group (%) ($n = 389$) | ≥65 Years of Age (%) ($n = 190$) | <65 Years of Age (%) ($n = 199$) | *P* Value |
|---|---|---|---|---|
| MVC | 112 (28.8%) | 23 (12.1%) | 89 (44.7%) | <.001 |
| Assault | 18 (4.6%) | 1 (0.5%) | 17 (8.5%) | |
| Fall from a height | 83 (21.3%) | 46 (24.2%) | 37 (18.6%) | |
| Fall from ground level | 131 (33.7%) | 106 (55.8%) | 25 (12.6%) | |
| Found down | 18 (4.6%) | 10 (5.3%) | 8 (4.0%) | |
| Other | 10 (2.6%) | 2 (1.1%) | 8 (4.0%) | |
| Pedestrian struck | 17 (4.4%) | 2 (1.1%) | 15 (7.5%) | |

[a] As seen in the table, the rates of MVCs and pedestrians struck were higher in patients younger than 65 years of age, while the rates of falls from the ground level and from a height were higher in those 65 years of age or older.

### *Regression Analysis*

When we looked at adjusted ORs for the association between the levels of cervical spine fractures and the covariates of age and mechanism of injury, we identified a significant increased risk for C2 fractures in those patients 65 years of age and older (OR, 2.09; 95% CI, 1.18–3.69). Falls from a height increased the risk of C6 (OR, 2.19; 95% CI, 1.14–4.24) and C7 (OR, 2.20; 95% CI, 1.14-4.24) fractures. Being found down was associated with a 3.93 OR (95% CI, 1.3 −11.83) for a C5 fracture. There were no differences between men and women.

The evaluation of the part of the vertebra injured versus covariates of age and mechanism showed ORs of 4.39 (95% CI, 1.55–12.48), 6.86 (95% CI, 1.19–39.36), and 3.63 (95% CI, 1.51–8.69) for type II odontoid fractures, type III odontoid fractures, and ligamentous injuries, respectively, in patients 65 years of age or older compared with those younger than 65 years of age. Patients with MVCs had an OR of 3.27 (95% CI, 1.48–7.22) for facet fractures and an OR of 2.80 (95% CI, 1.24–6.33) for transverse process fractures. Falls from heights increased the risk of spinous process (OR, 3.18; 95% CI, 1.50–6.74) and facet (OR, 2.45; 95% CI, 1.14–5.27) fractures. Once again there were no differences between men and women.

## DISCUSSION

In this study, we sought to determine whether the differences in mechanisms and types of cervical spine fractures found in the late 1990s in patients younger and older than 65 years of age[8,9] persisted in 2024, despite the aging of the population and the presumed healthier lifestyle in America in the past 30 years.[4-7] When comparing the younger than 65 and 65 years and older populations, we found that fractures in the older age group occurred only slightly more frequently (2.0% versus 1.6%, $P = .027$) than in the younger than 65 years of age cohort. These values are analogous to the 1.7% rate of cervical spine fractures in the younger than 65 years of age group originally cited in the CCR justification for including age older than 65 years in their recommendations because they had a 5.2%−6.6% rate of fractures in the older cohort.[8,9] We did not show a similar >3-fold increase in fractures in those 65 years and older. We note, however, that the older group had more fractures at C1 and C2, in the anterior or posterior arch of C1, and they occurred more commonly in women. The mechanism of injury was more commonly due to falls in the older group. The younger group had fractures that affected C5–C7 and the transverse processes and/or facets more commonly. These were often associated with higher impact injuries (MVCs and falls from a height) with a significantly lower rate of women affected (23.1%).

Injury patterns in the elderly may differ from those of younger patients because of differences in injury mechanisms, bone density, and the presence of degenerative changes affecting biomechanics. The center of the axis of rotation for flexion and extension within the cervical spine is located at level C5-C6, which is particularly vulnerable to injury.[10] As people age, the development of spondylosis deformans, including ligamentous degeneration and ossification, decreases the range of motion of the cervical spine,[9,11] Due to biomechanical changes, the axis of the flexion-extension center shifts to C1-C2.[8] As a result, mechanical

stress may concentrate at the weakest segments, leading to injury even with low-velocity mechanisms such as a fall.[11]

Numerous studies have found that the incidence of cervical spine fractures increases with age, especially within the upper cervical spine.[12-14] The most common vertebral body injured is C2, followed by C1, and within the lower vertebrae, injuries tend to present as multilevel injuries at the C5 and C6 vertebrae.[14] Berkay et al[15] found that the incidence rate of C2 fractures was statistically greater in older adults 65−79 years of age (incidence ratio, 3.21; $P < .05$) and the elderly population 80 years of age and older (incidence ratio, 15.9; $P < .05$) . Our OR for C2 fractures in those older than 65 years was 2.1, less than Berkay's OR. Falls from standing or a seated height are the most frequent causes for cervical spine injuries in patients older than 65 years of age.[14-20] Lomoschitz et al[14] found that patients who had low-energy mechanisms such as falls were more likely to sustain fractures in the upper cervical spine (OR, 2.2; 95% CI, 1.4–4.5; $P = .026$). We have, in 2024, supported the Lomoschitz et al findings from 2002 in our study.

**FIG 2.** This 55-year-old patient had a jumped facet at C6-7 associated with a pedicle fracture at C7 on the left side.

By contrast, Mendonça et al,[21] in 2021, examined cervical spine trauma resulting from ground-level falls and found no significant differences in the location or severity of fractures across various age groups among individuals aged 65 years and older. A prior study from Radmard et al[22] supported this finding in the 65 years and older group (Table 3). We have shown that there are significant differences when comparing individuals younger than 65 years of age with those 65 years of age and older. Asemota et al[23] reported that single-level fractures were more prevalent among older patients (85 years of age and older), while younger age groups (specifically 65−69 years) had a higher incidence of fractures accompanied by additional spinal cord injuries. Our data demonstrate a similar rate of multilevel fractures by age in our larger cohort than Asemota et al. Similarly, Rizvi et al[24] observed significant disparities specifically in odontoid fractures between elderly patients and younger cohorts, particularly those 85 years of age and older. However, within the younger age group (64 years and younger), no notable distinctions were identified across different age ranges. We have a similar conclusion within each age group but not across age groupings. These collective insights underscore the complex interplay of age-related factors and fracture patterns, reaffirming the need for further investigation into age-specific trends in cervical spine trauma.

Studies have shown that elderly patients with cervical spine injuries tend to have a worse prognosis than younger patients.[20,25] Bank et al[20] found that of the patients with cervical spine fractures, univariate analysis demonstrated that long-term survival decreased significantly in all patients older than 65 years of age (incidence ratio, 1.07; $P < .001$). Yokogawa et al[25] conducted a study to identify prognostic factors in patients with cervical spine injuries caused by ground-level falls; and the multivariate analysis showed that older age increases the risk of mortality (OR, 1.13; 95% CI, 1.07–1.20; $P < .001$). While we did not look at the prognosis of patients, we found that the rate of surgical correction (presumably for unstable fractures) was similar in our 2 age groups.

**Table 3: Breakdown of fractures of patients 65 years of age or older by age group[a]**

| Age | Total | Fx | No. Male | W/B/O | ASx Fx | Rate of Fractures+ | Rate of ASx Fractures vs Total Scanned++ |
|---|---|---|---|---|---|---|---|
| 65−70 yr | 2192 | 35 | 18 | 19/16/0 | 4 | 1.60% | 0.18% |
| 71−75 yr | 1840 | 31 | 12 | 23/6/2 | 5 | 1.68% | 0.27% |
| 76−80 yr | 1628 | 38 | 20 | 29/6/3 | 5 | 2.33% | 0.31% |
| 81−85 yr | 1487 | 37 | 14 | 32/5/0 | 4 | 2.49% | 0.27% |
| 86−90 yr | 1270 | 26 | 10 | 24/2/0 | 6 | 2.04% | 0.47% |
| >90 yr | 1038 | 25 | 5 | 21/3/1 | 4 | 2.41% | 0.39% |
| Total | 9455 | 192 | 79 | 148/38/6 | 28 | 2.03% | 0.30% |

**Note**:—ASx indicates asymptomatic group; Fx, cervical spine fracture; W, white; B, black; O, not white and not black).
[a] The table shows that the 65–70 year age group has the lowest rate of fractures and asymptomatic fractures. Data from reference 22.

As a radiologist, it is important to consider the patient's age, mechanism of injury, and clinical history before evaluating cervical spine imaging. Our data suggest that more careful scrutiny by radiologists of the C1-C2 levels (and the occipital condyles) on CSCT in the older populations and C5–C7 levels in the younger age groups is warranted. Additionally, those young patients with high-impact injuries from MVCs or

falls from a height are more likely to fracture their facets, transverse processes, and spinous processes than the elderly who more often fall from a ground level. Ligamentous injuries and epidural hematomas also predominated in the patients 65 years of age and older. Even though one might be tempted to lower one's suspicion of injuries in asymptomatic patients after scrutinizing the electronic medical records, 12.3% (48/389) of fractures occurred in asymptomatic patients.

### *Limitations*

The study herein represents the results from 2 different facilities of a major urban academic center. There is some inherent subjectivity in assessing patients for symptoms that are referable to the neck with regard to classifying the patients into the 2 categories because this was a retrospective study. The presence of cognitive impairment, for example, with a patient under the influence of drugs or alcohol may be subjective and may change during the course of an extended ED visit. We did not evaluate long-term outcomes or the comorbidities of the patients with and without fractures, which may be interesting information, but many variables could affect the data. Incomplete data during the emergency evaluation of a patient is not uncommon in ED notes, and as mentioned earlier, 98.8% of the cases were ordered due to trauma. Finally, we reviewed only the CSCT reports of fractures. We did not retrospectively re-examine the >20,000 CSCT images from 2018 to 2023 for any potential missed fractures. We also did not classify the different types of ligamentous injuries, look for neurovascular or intracranial injuries, or use the AO Spine classification scheme.

## CONCLUSIONS

The difference in the mechanisms of and characteristics of fractures in our younger than 65 and 65 and older age groups highlighted areas of heightened concern in the upper spine in the elderly and lower spine in the younger cohort. This increased concern may be related to the different mechanisms of injury between the 2 age groups. We have identified a significant change in the rate of fractures in the 65 year and older group (2.0%) in the timeframe of 2018−2023, decreasing compared with the 5.2%−6.6% rate reported in *JAMA* in 2001 and *New England Journal of Medicine* in 2003.[8,9] Nonetheless the trends in the types of fractures in the different age ranges and the mechanisms of injury have remained constant since that time.

Disclosure forms provided by the authors are available with the full text and PDF of this article at www.ajnr.org.

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