Original Research

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Demographic and Clinical Predictors of Rib Fracture, Complication, and Follow-up Among Patients With Rib Injuries Presenting to Urgent Care

Urgent Message: This retrospective cross-sectional study found more than one-third of patients who presented to urgent care with rib injuries had rib fractures. Rib fracture was associated with male sex, older age, Spanish-speaking status, White race, and abnormal vital signs.

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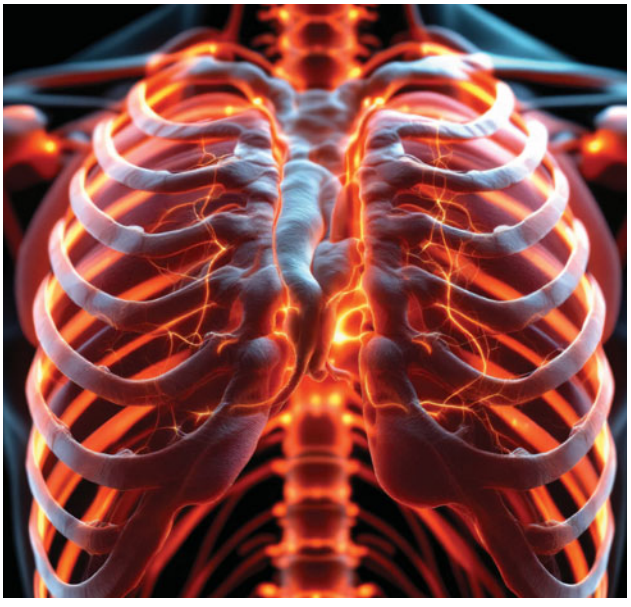

Abstract

Introduction: Patients with rib injuries and fractures commonly present to acute care. Evidence from emergency departments (EDs) demonstrates significant morbidity, however, less is known about urgent care (UC) patients. We aimed to examine the rates of rib injury, rib fracture, and complications (ie, pneumothorax, hemothorax) in urgent care and identify demographic and clinical predictors of fracture, complications, and need for follow-up care.

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Methods: This is a retrospective cross-sectional study of adult patient encounters at 2 UC clinics in an urban safety-net health system from May 1, 2016, to March 31, 2025. Primary outcomes were rates of rib injury and rib fracture; secondary outcomes were complications, disposition from UC, and 7-day ED/UC return visit. Statistical analysis was performed using multivariable logistic regression.

Results: Across 2,188 UC encounters for rib injury, 747 (34.1%) included a rib fracture and 33 (1.5%) had complications. Females had lower odds of fracture compared with males (odds ratio [OR], 0.641; 95% confidence interval [CI], 0.527–0.779). Higher odds of fracture were observed for age 45–64 (OR, 2.213; 95% CI, 1.792–2.733), age ≥65 (OR, 2.395; 95% CI, 1.732–3.312), Spanish language (OR, 1.516; 95% CI, 1.106–2.078), White race (OR, 1.309; 95% CI, 1.040–1.649), and abnormal vital signs (OR, 1.573; 95% CI, 1.169–2.118). Among fracture encounters, higher odds of complications were associated with abnormal vital signs (OR, 3.980; 95% CI, 1.816–8.726), and non-English/Spanish language (OR, 5.841; 95% CI, 1.518–22.469). Complications resulted in higher odds of ED transfer (OR, 5.829; 95% CI, 2.351–14.455) and hospital admission (OR, 21.666; 95% CI, 6.917–67.869).

Discussion: More than one-third of patients who presented to urgent care with rib injuries had rib fractures. Rib fracture was associated with male sex, older age, Spanish-speaking status, White race, and abnormal vital signs. For complications, male sex, non-English/Spanish language, and abnormal vital signs were key predictors. Complications, in turn, strongly predicted ED transfer and hospital admission. Incorporating these predictors into clinical workflows may promote safer, more efficient patient care.

Introduction

Rib injuries and fractures are a common presentation to emergency departments (EDs). Effective evaluation and management of rib fractures—including timely diagnosis, pain control, and assessment for complications—is crucial in optimizing patient outcomes and preventing unnecessary returns to care. Patients with rib fractures present to EDs frequently following significant thoracic trauma. There is evidence that those with rib fractures, particularly older adults or those with comorbidities, experience substantial morbidity and mortality, including pulmonary contusion, hemothorax, pneumothorax, pneumonia, and even cardiac and vascular injuries.[1-5] Older adults with rib fractures experience approximately twice the mortality and pneumonia risk compared with younger patients with similar injuries, suggesting that trauma definitions based solely on mechanism or fracture burden may underestimate injury severity in older adults—a concern echoed in contemporary reviews of geriatric chest wall trauma.[1,6] Of note, complication rates in middle-aged adults (45–65 years) are comparable to those over 65 years of age.[7]

Among trauma patients with rib fractures, pneumothorax occurred in 25.3–37.2%, hemothorax in 20.9–26.8%, pulmonary contusion in 17.2%, and flail chest in 5.8% of patients, highlighting the high prevalence of these life-threatening complications.[3-4] Lung lacerations from rib fractures may occur and often require prompt intervention to prevent clinical deterioration.[8] Increased risk of thoracic cavity injuries occurs in patients with respiratory distress, multiple rib fractures, or underlying cardiopulmonary disease.[3,4,8] Severe, life-threatening complications can occur even after low-energy transfer injuries, such as falls from standing height in older adults, as reported in a case of aortic laceration requiring emergent surgical intervention from posterior rib fractures following a fall at home.[9]

In addition to thoracic complications, specific rib fracture patterns—particularly involving the middle and lower ribs—have been strongly associated with intra-abdominal solid organ injuries. More than half of patients with multiple lower rib fractures had concurrent abdominal injury;[10] specifically, 57% of intra-abdominal injuries occurred with fractures of the 9th–12th ribs, most often affecting the liver and spleen.[11] Fractures of the 6th and 7th ribs are also significant predictors of abdominal injuries in blunt chest trauma.[12] Therefore, middle and lower rib fractures warrant early abdominal imaging due to their strong association with solid organ injury.[13] In hemodynamically stable blunt trauma patients, contrast-enhanced computed tomography (CT) is the preferred imaging modality for evaluation of suspected intra-abdominal injury, as plain radiographs and ultrasound are insufficient for reliably detecting solid-organ injury.[14,15]

Delayed complications from rib fractures are also a significant concern. Risk factors for delayed hemothorax include older age, mechanical ventilation use, initial pneumothorax or hemothorax, and displaced rib fractures (especially 2 or more).[5] The risk of delayed pneumothorax exists for patients with minor rib fractures, particularly those with subcutaneous emphysema.[16] Pneumonia is a common adverse outcome. Risk factors for pneumonia following rib fracture include male

gender, alcohol use, multiple rib fractures, and higher rates of intravenous fluid during the initial 24 hours following trauma.[17] Even isolated minor rib fractures significantly increase pneumonia risk, especially in elderly patients over age 65 with 2 rib fractures, and those with chronic obstructive pulmonary disease (COPD).[2] Pneumonia is associated with increased mortality in patients with isolated thoracic trauma.[18]

Imaging modalities for rib injuries also vary. Immediate imaging—typically with upright chest radiography or bedside ultrasound—is essential for early diagnosis.[3] However, there are imaging challenges and potential pitfalls in diagnosing rib fractures.[19] Factors influencing the need for CT imaging in rib fracture patients include 3 or more rib fractures, posterior or lateral fracture location, and oxygen supplementation needs.[20] Ultrasonography is a reliable alternative to CT for diagnosing rib fractures in blunt chest trauma.[21] Of note, in the setting of polytrauma or when associated intrathoracic or intra-abdominal injury is suspected, ultrasound has limited sensitivity for detecting contained or transient solid-organ injuries, and CT remains the preferred modality for comprehensive injury assessment.[14,15]

In summary, the ED literature demonstrates details about diagnoses, complications, and outcomes for rib injury and rib fracture patients. However, the prevalence, presenting features, and complications of rib injuries in patients presenting to urgent care (UC) clinics are unknown. This study aimed to evaluate patient rates of rib injuries, rib fractures, and rib fracture-related complications among patients presenting to urgent care settings based on clinical and demographic factors.

Methods

This was a retrospective cross-sectional study, based on electronic health record (EHR) data. Rib injury data were collected from the Denver Health Federico F. Peña Southwest Urgent Care Clinic (PUCC) and the Adult Urgent Care Clinic (AUCC). PUCC and AUCC are federally qualified health centers affiliated with Denver Health and Hospital Authority (DHHA), an urban safety-net health system. Data was collected for patients aged 18 years or older between May 1, 2016, and March 31, 2025, based on a diagnosis of rib injury-related ICD-10 codes **(Supplemental Material on jucm.com)**. If the same patient presented with rib injury 90 days or more after the initial encounter, we considered it a separate encounter. Specific patient demographics included age, race/ethnicity, sex, payer source, housing status, preferred language, medical comorbidity (diabetes mellitus, asthma/COPD, cardiac disease, coronary artery disease, hypertension, hyperlipidemia), and vital signs (pulse >100 beats per minute; respiratory rate >20 breaths per minute; SpO2 <90%; and systolic blood pressure <100 mmHg). For comorbid conditions, encounter diagnoses within 2 years of the urgent care date were included in the study.

Primary outcomes were the rates of urgent care visits for rib injuries and rib fractures. Secondary outcomes were specific to rib fractures: rate of complications (pneumonia, pneumothorax, hemothorax), discharge status (discharge home, transfer to the ED, hospital admission), and 7-day outcome (return visit to the ED/UC). Diagnoses for the primary outcome and secondary outcome complications were based on ICD-10 codes. Discharge status and 7-day outcomes were captured from within the health system EHR.

Categorical variables were summarized as counts and percentages. Differences between groups for each outcome were evaluated using Pearson chi-squared tests. All tests were 2-sided, and a p-value <0.05 was considered statistically significant. Multivariable logistic regression was used to calculate the adjusted odds ratios and 95% confidence intervals for each outcome. All analyses were conducted using SAS Enterprise Guide 8.3.

The Denver Health and Hospital Authority Quality Improvement Committee (authorized by the Colorado Multiple Institutional Review Board at the University of Colorado, Denver) reviewed the project methodology and determined it to be non-human subject research.

Results

Out of 497,393 adult urgent care encounters, a total of 2,188 patient encounters (0.44%) had rib-related injuries. Of these, 747 (34.1%) patient encounters included a rib fracture, and 33 (1.5%) experienced complications. The demographic characteristics of these patients, including sex, age, race/ethnicity, insurance, housing status, language, and presence of comorbidities are summarized in **Table 1**.

Our multivariate logistic regression analysis demonstrated that female patients had lower odds of having a rib fracture compared with male patients (odds ratio [OR], 0.641; 95% confidence interval [CI], 0.527–0.779; p<0.0001). Patients aged 45–64 years had higher odds of rib fracture compared with those aged 18–44 years (OR, 2.213; 95% CI, 1.792–2.733; p=0.0007), and patients aged 65 years and older also had higher odds of rib fracture compared with those aged 18–44 (OR, 2.395; 95% CI, 1.732–3.312; p=0.0016). Spanish-speaking patients had higher odds of rib fracture compared with

Table 1. Demographic Characteristics of Urgent Care Rib Injury Encounters

	Rib Injury Encounters	Rib Fracture Present	P-Value	Complication From Injury	P-Value
Total Patient Encounters	**2,188**	**747 (34.1%)**		**33 (1.5%)**	
Gender (Sex) Male Female Unknown	 1,350 *Suppress* *Suppress*	 510 (68.3%) *Suppress* *Suppress*	P < 0.0001	 28 (84.4%) *Suppress* *Suppress*	P = 0.0060
Age Group 18-44 years 45-64 years 65+ years	 1,143 801 244	 302 (40.4%) 342 (45.8%) 103 (13.8%)	P < 0.0001	 15 (45.5%) *Suppress* *Suppress*	P = 0.7287
Race/Ethnicity Hispanic White Black/African American Other	 984 908 163 133	 320 (42.8%) 332 (44.4%) 48 (6.4%) 47 (6.3%)	P = 0.1576	 11 (33.3%) 19 (57.6%) *Suppress* *Suppress*	P = 0.2345
Payer Commercial Insurance Medicaid/Medicare Uninsured	 411 1,307 470	 129 (17.3%) 474 (63.5%) 144 (19.3%)	P = 0.0373	 *Suppress* 24 (72.7%) *Suppress*	P = 0.2796
Housing Status Housed Unhoused Unknown	 1,894 82 212	 632 (84.6%) 38 (5.1%) 77 (10.3%)	P = 0.0412	 29 (87.9%) *Suppress* *Suppress*	P = 0.1292
Language English Spanish Other	 1,732 375 81	 582 (77.9%) 141 (18.9%) 24 (3.2%)	P = 0.2286	 26 (78.8%) *Suppress* *Suppress*	P = 0.2100
Comorbid Conditions Any (DM, Asthma/COPD, Cardiac) No comorbidities	 708 1,480	 254 (34.0%) 493 (66.0%)	P = 0.2365	 14 (42.4%) 19 (57.6%)	P = 0.2130
Vital Signs Any Abnormal Vital Signs No Abnormal Vital Signs	 219 1,969	 97 (13.0%) 650 (87.0%)	P = 0.0008	 10 (30.3%) 23 (69.7%)	P < 0.0001
Complications Yes No	 33 2,155	 27 (3.6%) 720 (96.4%)	P < 0.0001		

Patient demographic characteristics of included urgent care rib injury encounters, overall and by rib fracture and complication states. *Suppress*—Data suppressed due to low numbers to preserve patient confidentiality. Abbreviations: DM—diabetes mellitus; COPD—chronic obstructive pulmonary disease.

English-speaking patients (OR, 1.516; 95% CI, 1.106–2.078; p=0.0046). Patients with any comorbidity had lower odds of rib fracture compared with those without comorbidities (OR, 0.787; 95% CI, 0.631–0.981; p=0.0329). Patients presenting with abnormal vital signs had higher odds of rib fracture than those with normal vital signs (OR, 1.573; 95% CI, 1.169–2.118; p=0.0028) **(Table 2)**.

Patients who experienced complications had significantly higher odds of rib fracture compared with those without complications (OR, 7.727; 95% CI, 3.114–19.175; p<0.0001).

Table 2. Adjusted Odds Ratios for Rib Fracture and Complications

		Rib Fracture		Complications	
Factor		**OR**	**95% CI**	**OR**	**95% CI**
Sex	Male	—	—	—	—
	Female	0.641	0.527 0.779	0.278	0.105 0.738
Age in Years	Ages 18-44	—	—	—	—
	Ages 45-64	2.213	1.792 2.733	1.163	0.518 2.612
	Ages ≥65	2.395	1.732 3.312	1.358	0.396 4.656
Language	English	—	—	—	—
	Other	0.738	0.429 1.269	5.841	1.518 22.469
	Spanish	1.516	1.106 2.078	1.522	0.394 5.882
Race/Ethnicity	Hispanic	—	—	—	—
	Black/African American	0.926	0.624 1.373	1.179	0.288 4.826
	Other	1.387	0.909 2.117	—	—
	White	1.309	1.040 1.649	1.788	0.732 4.367
Insurance	Medicaid/Medicare	—	—	—	—
	Commercial	0.927	0.717 1.199	0.806	0.286 2.268
	Uninsured	0.767	0.582 1.013	0.456	0.137 1.518
Housing Status	Housed	—	—	—	—
	Unknown	1.094	0.802 1.492	0.311	0.041 2.354
	Unhoused	1.434	0.895 2.298	1.566	0.435 5.631
Comorbidity	None	—	—	—	—
	Any Comorbidity	0.787	0.631 0.981	1.496	0.678 3.303
Abnormal Vital Signs	None	—	—	—	—
	Abnormal Vital Signs	1.573	1.169 2.118	3.980	1.816 8.726
Complications	No Complications	—	—	—	—
	Complications	7.727	3.114 19.175	—	—

Adjusted odds ratio (OR) and 95% confidence interval (CI) for rib fracture and for complication among urgent care rib injury encounters by multivariable logistic regression with covariates of sex, age, language, race/ethnicity, insurance, housing status, comorbidity, abnormal vital signs and complications.

Among race/ethnicity comparisons, White patients had higher odds of rib fracture compared with Hispanic patients (OR, 1.309; 95% CI, 1.040–1.649). However, comparisons between Hispanic and Black/African American or other race groups did not show statistically significant differences. Other demographic factors, including insurance status and housing status, did not show statistically significant associations with rib fracture **(Table 2)**.

Female patients had significantly lower odds of experiencing complications compared to male patients (OR, 0.278; 95% CI, 0.105–0.738; p=0.0102). Patients with abnormal vital signs had significantly higher odds of experiencing complications than those with normal vitals (OR, 3.980; 95% CI, 1.816–8.726; p=0.0006). Patients who spoke a language other than English or Spanish had increased odds of complications compared to English speakers (OR, 5.841; 95% CI, 1.518–22.469; p=0.0281). Notably, age, race/ethnicity, insurance type, housing status, and comorbidities were not found to be significantly associated with the occurrence of complications **(Table 2)**.

Patients who experienced complications had significantly higher odds of being admitted to the hospital

compared to those without complications (OR, 21.666; 95% CI, 6.917–67.869; p<0.0001). Similarly, patients with complications had higher odds of being transferred to the ED than those without complications (OR, 5.829; 95% CI, 2.351–14.455; p=0.0001). For ED transfer, uninsured patients had lower odds of being transferred to the ED compared to those with Medicaid or Medicare (OR, 0.312; 95% CI, 0.139–0.702; p=0.0161). Other variables, including age, sex, language, race/ethnicity, housing status, comorbidities, and abnormal vital signs, did not show statistically significant associations with either ED transfer or hospital admission. Among patients discharged home, the presence of any comorbidity had higher odds of a 7-day return visit to the ED/UC compared to those without any comorbidity (OR, 1.81; 95% CI, 1.162–2.819; p=0.0087).

Among patients with rib fractures, the presence of complications had higher odds of transfer to the ED compared to those without complications (OR, 4.320; 95% CI, 1.537–12.141; p=0.0055). Similarly, patients with rib fractures with complications had higher odds of admission to the hospital compared to those without complications (OR, 9.917; 95% CI, 2.792–35.232; p=0.0004). There was no statistically significant association with any variables and 7-day return visits to ED/UC in patients with rib fractures.

Discussion

This study evaluated the rates of rib injury, rib fracture, and complications presenting to urgent care. It also identified demographic and clinical factors associated with rib fracture, complications, and subsequent healthcare utilization (hospital admission, ED transfer, and 7-day ED/UC return visit) in a large cohort of patients presenting to 2 urgent care clinics within 1 safety-net health system. Of rib injuries, rib fractures occurred in a little over one-third of patients. Older age, male sex, abnormal vital signs, Spanish-speaking status, presence of complications, and absence of medical comorbidities had higher odds of rib fracture. There were higher odds of complications among those with male sex, abnormal vital signs, and a non-English/Spanish language preference. ED transfer and hospital admission showed higher odds with the presence of complications; 7-day ED/UC return visit showed higher odds with the presence of medical comorbidities. The above demographic characteristics should elevate a clinician's concern for the patient and increase the likelihood for ED transfer.

No previous literature was found for the study of rib injury or rib fracture in patients presenting to the urgent care setting. The most relevant literature reviewed was related to patients presenting in EDs. In EDs, older age, male sex, and comorbidities are risk factors for complications, and abnormal vital signs had higher odds of complications in patients with rib fractures.[2,3,5,17] In our study, older age, male sex, and abnormal vital signs were associated with higher odds of rib fractures. However, comorbidities showed an inverse relationship—patients with comorbidities had lower odds of being diagnosed with rib fractures. Additionally, our study identified novel associations: Spanish-speaking status and White race had higher odds of rib fracture diagnosis. In addition to abnormal vital signs, male sex and non-English/Spanish-speaking status had higher odds of complications.

Patterns, such as age, abnormal vital signs, and presence of complications, are expected correlations. The relationship between abnormal vital signs and both fracture and complication risk was anticipated and validates the clinical importance of triage assessment. The association of complications with subsequent ED transfer and hospital admission aligns with clinical expectations that complications mark a need for a higher level of care. The association between the absence of comorbidities and higher odds of fracture was unexpected; 1 possible explanation is that healthier patients may be more likely to engage in higher-risk physical activity, leading to trauma. The increased risk of complications in non-English speakers was an unexpected finding that needs further investigation.

Limitations

Our study leverages real-world data from an urban safety-net health system, tracking outcomes across the urgent care-to-ED continuum and capturing discharge to home, ED transfers, hospital admissions, and 7-day ED/UC return visits.

There are several limitations of this study. First, it is based on EHR data and ICD-10 diagnoses. This may not capture all patients with these diagnoses. Second, 7-day outcomes were limited to those that occurred within the DH system, so patients may have been lost if they presented to an outside hospital. Third, the study was conducted in 2 urgent care clinics, which limits its ability to be generalized to other urgent care clinics. Fourth, this study employed a retrospective design, which limits causal inference. Fifth, there may be other nonidentified patient factors such as occupation that may be contributing to the findings. Sixth, complication rates were low, thus limiting subgroup analysis.

Our study suggests several possible directions for future work. Studies could investigate mechanisms behind

disparities observed among non-English speakers, including occupation, language services, access to imaging, follow-up, and understanding of discharge plans. Further exploration is needed to clarify the role of comorbidities in patients with rib fractures. Prospective, multicenter studies—ideally incorporating structured pain management, social risk measures, and imaging details—could validate these predictors and support development of risk-stratified pathways for urgent care disposition and follow-up.

In summary, this study adds to the limited literature on rib injuries presenting in urgent care clinics and highlights predictors of fracture, complications, and escalation of care. By identifying higher-risk subgroups—older patients, males, those with abnormal vital signs, and Spanish speakers—clinicians in urgent care settings can better tailor diagnostic strategies, disposition decisions, and follow-up plans.

Conclusion

This study identifies the rates of rib injuries and fractures in a cohort of UC patients. Additionally, it identifies demographic and clinical predictors of rib fracture, complications, and follow-up. Older age, male sex, abnormal vital signs, Spanish language, and White race were associated with higher odds of rib fracture; whereas clinical comorbidity showed lower odds. Complications were more likely among males, patients with abnormal vital signs, and those with a non-English/Spanish language. The presence of complications strongly predicted transfer to the ED and hospital admission; clinical comorbidity was associated with 7-day return visit among patients discharged home. Further research is needed to determine if these findings are present in other urgent care clinics. ■

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