Time to Closed Reduction in the ED: Who is at Risk for Delays and Does it Matter?

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INTRODUCTION: Closed reduction (CR) under conscious sedation in the emergency department (ED) is the standard of care for many pediatric fractures. While considerable emphasis is placed on improving ED efficiency and time to reduction (TTR), there is a paucity of research on factors associated with TTR and the implications of delays in reduction. Such delays can exacerbate outcomes, prolong pain, and lead to increased complications, highlighting the need for a detailed examination of TTR and its associated factors. This study addresses this significant gap in pediatric orthopaedic care by investigating the influence of clinical, demographic, and socioeconomic factors on TTR in the ED setting for pediatric extremity fracture presentations.

METHODS:

This retrospective study examined all fractures managed with CR under conscious sedation in University of California, San Francisco pediatric emergency departments over a five-year period (2017-2022). Patients between the ages of 5-18 with a single, closed upper or lower extremity fracture were included while patients with polytrauma, open fractures, nonextremity fractures, or those transferred from outside facilities were excluded. TTR was defined as the interval from ED presentation to the start of conscious sedation for CR. Chart review was performed to collect the following patient data: gender, age, race, ethnicity, primary language, insurance status, state acuity deprivation index (ADI), national ADI, and fracture location. Fracture parameters were measured by x-ray to determine residual coronal angulation, sagittal angulation, translation, and shortening of extremity fractures pre-CR versus post-CR. Comparative and multivariate analyses were conducted to assess for significant differences in TTR and correlations between patient variables and TTR. RESULTS:

This study included 310 patients with a mean age of 10 years (SD 3.2 years), 68% of whom were male. The cohort's mean TTR was 199 minutes (SD: 124 min). Comparative analysis demonstrated that White patients had shorter waiting times compared to non-White patients (171 min vs. 217 min, p<0.01). TTR was also longer for Hispanic patients compared to non-Hispanic patients (239 min vs. 180 min, p<0.01), non-English speakers compared to primary English speakers (249 min vs. 188 min, p<0.01), and patients with government insurance compared to private insurance (215 min vs. 184 min, p=0.03). There was no significant correlation between TTR and the following residual fracture parameters pre-CR versus post-CR on the day of ED presentation: coronal angulation (r=-0.03, p>0.05), sagittal angulation (r=-0.03, p>0.05), shortening (r=-0.02, p>0.05), and translation (r=-0.05, p>0.05). Additionally, there was no significant correlation between morphine-equivalent units administered in the ED and TTR (r=-0.06, p>0.05). Multivariate analysis, accounting for gender, age, race, ethnicity, primary language, insurance status, state acuity deprivation index (ADI), national ADI, and fracture location, demonstrated that non-White, Hispanic/Latino, and non-English speaking patients experienced TTR lengths that were 32.4 minutes (p=0.04), 37.7 minutes (p=0.02), and 41.8 minutes (p=0.03) longer, respectively, when compared to their White, non-Hispanic/Latino, and English-speaking counterparts (Table I).

DISCUSSION AND CONCLUSION: The study highlights significant disparities in TTR for pediatric fractures managed with CR under conscious sedation in the ED. Non-White, Hispanic, and non-English-speaking patients, as well as those with government insurance, experienced longer TTR compared to their White, non-Hispanic, English-speaking, and privately insured counterparts. These disparities likely stem from a combination of systemic biases, communication barriers, and differential access to healthcare resources. The absence of a significant correlation between TTR and residual fracture parameters or the amount of analgesia administered suggests that delayed reductions do not immediately impact radiographic outcomes. However, the prolonged wait times reflect deeper inefficiencies and inequities in healthcare. Potential underlying reasons for these findings include implicit bias among healthcare providers, structural barriers within the ED, and inadequate communication support for non-English speakers. Future research should focus on identifying specific ED processes that contribute to these delays and developing targeted interventions. Possible strategies include implementing robust and increased language services, providing cultural competency training for ED staff, and creating streamlined care pathways for patients with government insurance. Addressing these factors could lead to more equitable healthcare, ensuring timely and efficient care for all pediatric patients, regardless of their demographic or socioeconomic background.

	Adjusted TTR Difference (min)	95% Confidence Interval	P-value (a = 0.05)
Gender			
Female	15.5	(-14.6.45.6)	0.31
Apr2			
10-18	1.0	(-26.9, 28.8)	0.95
Race			
Non-White	32.4	(1.6, 63.2)	0.04*
Ethnicity ⁴			
Hispanic/Latino	37.7	(5.5, 70.0)	0.02*
Primary Languages			
Non-English	41.8	(3.5, 80.1)	0.03*
Insurance Status ⁴			
Public Insurance	4.6	(-23.2, 32.4)	0.74
State Acuity Deprivation Index (ADI) Decile (1-10) ⁷			
6-10	-23.9	(+74.5, 26.6)	0.35
National Acuity Deprivation Index (ADI) Percentile (1-100) ¹			
21-100	8.2	(-49.2, 65.6)	0.78
Location of Fracture ⁸			
Upper Extremity	-27.2	(-62.2, 7.8)	0.13
'arameter estimates for linear regression etween 5-10 years of age ² , White patient satients ⁶ , privately insured patients ⁶ , patien satients with national ADI index ratings b	analysis. Reference 5 s ³ , Non-Hispanic/La nts with state ADI in etween 1-20 ⁸ , and p	proups include males ¹ , tino patients ⁴ , English dex ratings between 1- atients with lower extr	patients -speaking 5 ⁷ , emity