

Treatment of Pain in Pediatric Long Bone Fractures- Does it Differ in General and Pediatric Emergency Departments?

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Abstract

Background: Most American children still receive emergency care outside of specific pediatric emergency departments (PEDs). Injuries are a common pediatric complaint treated in general emergency departments (GEDs), with the most common being long bone fractures. Timely pain assessment and management are important benchmarks included in pediatric readiness and facility recognition.

Objective: To evaluate pain medication administration patterns in pediatric patients with long bone fractures presenting to PEDs and GEDs and to use the extracted data to shape efforts for improved pediatric pain management across all emergency departments.

Methods: A national database of 3.5 million pediatric emergency department patient visits between 2017-2021 from was retrospectively analyzed for visits with a diagnosis of isolated long-bone fracture injury. Differences in rates of medication administration, types of medication administered, and time to medication administration were analyzed. Adjusted odds ratios were calculated to analyze predictive factors for pain medication administration and timeliness.

Results: There were 12,414 visits in 8 PED facilities and 34,519 visits in 142 GED facilities available for analysis. 74.5% of patients in PEDs received any pain medication, as opposed to only 69.6% of patients in GEDs ($p<0.001$). Opioids, ketamine, and local anesthetics were more commonly used in PEDs, whereas acetaminophen and NSAIDs were more commonly used in GEDs ($p<0.001$). Opiate prescriptions at discharge were significantly more common in GEDs (6% vs 13.9%, $p<0.001$). Medications were administered with a median time of 37.5 minutes in PEDs and 49.0 minutes in GEDs ($p<0.001$). In adjusted models, presentation to a PED was not significantly associated with receipt of pain medication (AOR 1.300 [0.914, 1.847]), but was predictive of receipt of pain medication within 30 minutes of arrival (aOR 2.298 [1.272, 4.152]).

Conclusions: This data highlights broad differences in treatment of pain in isolated pediatric long bone fracture patients in PEDs and GEDs. Use of 'stronger' medications such as opiates, ketamine and sedatives during the ED visit, more sedation procedures, and more admissions occurred in PEDs, likely due to increased injury severity. However, opiate prescriptions were more common on discharge from GEDs. Administration of more timely medications in PEDs suggests that there is education and outreach to be done in GED settings to improve pediatric pain management.

Figure 1. Study Cohort

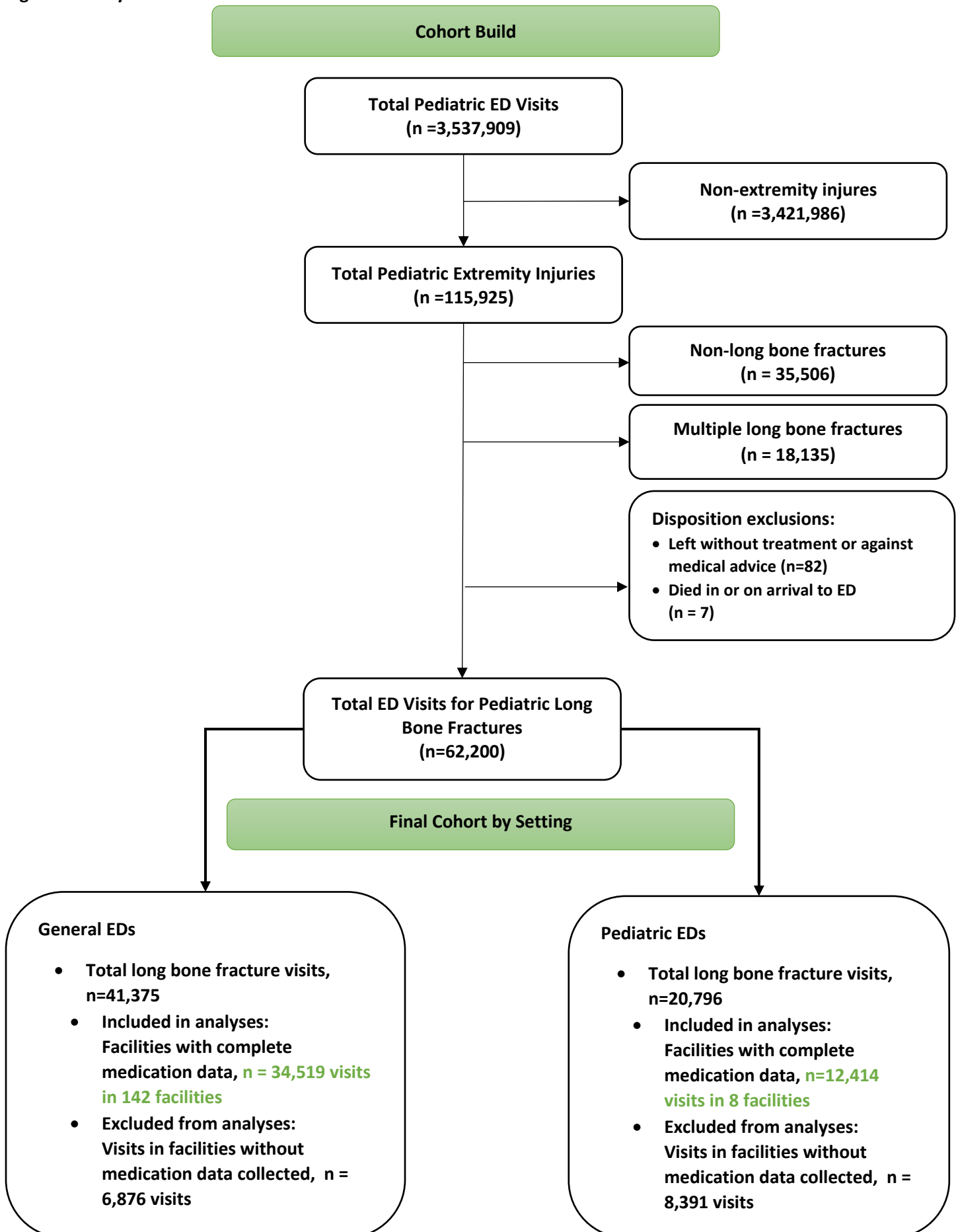


Table 1. Demographics

	Site Type			
	General ED N	Percent	Pediatric N	Percent
Patient age (years)				
0-3	4,839	14.02	2,987	24.06
4-8	10,152	29.41	4,309	34.71
9-15	15,428	44.69	4,522	36.43
16-18	4,100	11.88	596	4.80
Patient gender				
Male	21,207	61.44	7,453	60.04
Female	13,312	38.56	4,961	39.96
Disposition				
Discharge	31,156	90.28	9,921	79.96
Admission	1,372	3.98	2,349	18.93
Transfer	1,983	5.75	137	1.10
ESI triage level				
1	82	0.24	57	0.46
2	1,730	5.13	2,554	20.65
3	9,324	27.65	4,661	37.69
4	22,385	66.38	5,048	40.82
5	199	0.59	47	0.38
Payment source				
Commercial	13,958	40.44	4,026	32.43
Public Insurance	16,905	48.97	7,069	56.94
Self-Pay	2,651	7.68	1,155	9.30
Other	1,005	2.91	164	1.32
Clinician type				
Physician	18,990	55.01	10,464	84.29
APP	14,276	41.36	1,751	14.11
Both 50/50	1,253	3.63	199	1.60

Notes: Data includes visits at 142 general EDs and 8 pediatric EDs from the period January 1, 2017 to June 30, 2021.

Table 2. Medication Administration

	PED	GED	Difference	Two-sided p-value
Any analgesia administered in the ED	0.745	0.696	0.049	0.000
Medication Types:				
Opioids	0.417	0.350	0.067	0.000
Ketamine	0.106	0.061	0.046	0.000
Sedative	0.075	0.040	0.035	0.000
Local	0.048	0.026	0.022	0.000
NSAID	0.597	0.634	-0.037	0.000
Tylenol	0.090	0.210	-0.120	0.000
Medication Routes:				
Route = PO	0.547	0.702	-0.155	0.000
Route = Parenteral	0.430	0.266	0.165	0.000
Route = SQ/Topical	0.002	0.001	0.001	0.085
Parenteral Routes:				
Route = IV	0.170	0.106	0.064	0.000
Route = IM	0.002	0.017	-0.015	0.000
Route = IN	0.000	0.001	-0.001	0.018
Route = Unknown	0.828	0.876	-0.048	0.000
Any sedation procedure	0.048	0.029	0.020	0.000
Opioid Rx at discharge	0.060	0.139	-0.079	0.000

Table 3. Medication Timing

	PED	GED	Difference (PED-GED)	p-value
Median time to first medication (mins)	37.5	49.0	-11.6	0.000
Proportion of visits receiving pain med in <30 mins	0.402	0.273	-0.129	0.000

Note: Data excludes patients that did not receive a pain medication in the ED (n=13,665) and patients with missing medication timing (n=4,670)

Table 4. Logistic regression analyses for receipt of pain medication (any) during an ED visit

	Unadjusted OR			Adjusted OR		
	OR	95% CI	p-value	OR	95% CI	p-value
Site_Type=ED	[Ref]			[Ref]		
Site_Type=Pediatric	1.281	(0.974, 1.685)	0.076	1.300	(0.914, 1.847)	0.144
Patient age=0-3	[Ref]			[Ref]		
Patient age=4-8	1.251	(1.109, 1.411)	0.000	1.212	(1.080, 1.360)	0.001
Patient age=9-15	1.079	(0.947, 1.229)	0.253	1.103	(0.967, 1.257)	0.143
Patient age=16-18	1.197	(1.061, 1.352)	0.004	1.165	(1.001, 1.355)	0.048
Patient gender=Male	[Ref]			[Ref]		
Patient gender=Female	0.944	(0.903, 0.988)	0.012	0.997	(0.952, 1.044)	0.904
Payment source=Commercial	[Ref]			[Ref]		
Payment source=Public Insurance	0.898	(0.842, 0.957)	0.001	1.013	(0.956, 1.074)	0.652
Payment source=Self-Pay	1.033	(0.936, 1.139)	0.523	1.091	(0.982, 1.212)	0.103
Payment source=Other	0.925	(0.766, 1.117)	0.419	1.032	(0.860, 1.238)	0.735
ESI triage level=1	[Ref]			[Ref]		
ESI triage level=2	1.729	(0.761, 3.929)	0.191	1.724	(0.758, 3.922)	0.194
ESI triage level=3	0.968	(0.518, 1.809)	0.920	1.093	(0.561, 2.131)	0.793
ESI triage level=4	0.429	(0.224, 0.822)	0.011	0.554	(0.275, 1.117)	0.099
ESI triage level=5	0.121	(0.062, 0.236)	0.000	0.158	(0.077, 0.323)	0.000
Did not receive sedation procedure	[Ref]			[Ref]		
Received sedation procedure	23.751	(12.480, 45.203)	0.000	14.643	(7.786, 27.539)	0.000
Disposition=Discharge	[Ref]			[Ref]		
Disposition=Admission	1.937	(1.528, 2.454)	0.000	1.093	(0.847, 1.409)	0.495
Disposition=Transfer	4.009	(3.321, 4.840)	0.000	3.008	(2.504, 3.612)	0.000
Clinician type=Physician	[Ref]			[Ref]		
Clinician type=APP	0.685	(0.592, 0.793)	0.000	0.938	(0.830, 1.061)	0.308
Clinician type=Both 50/50	1.563	(1.152, 2.119)	0.004	1.451	(1.187, 1.773)	0.000
Pediatric volume, in 1000s	1.000	(0.994, 1.007)	0.931	0.995	(0.990, 1.000)	0.044

Notes: Confidence intervals estimated using standard errors clustered at the facility-level.

Table 5. Logistic regression analyses for *time to receipt of pain medication (any) in <30 min during ED visit (Wagers et al 2019 metric goal)*

	Unadjusted OR				Adjusted OR			
	OR	95% CI		p-value	OR	95% CI		p-value
Site_Type=ED	[Ref]				[Ref]			
Site_Type=Pediatric	1.780	(1.128,	2.808)	0.013	2.298	(1.272,	4.152)	0.006
Patient age=0-3	[Ref]				[Ref]			
Patient age=4-8	1.259	(1.158,	1.369)	0.000	1.263	(1.138,	1.401)	0.000
Patient age=9-15	1.228	(1.098,	1.375)	0.000	1.288	(1.147,	1.447)	0.000
Patient age=16-18	1.162	(0.944,	1.430)	0.156	1.227	(1.063,	1.417)	0.005
Patient gender=Male	[Ref]				[Ref]			
Patient gender=Female	0.916	(0.870,	0.965)	0.001	0.951	(0.903,	1.002)	0.061
Payment source=Commercial	[Ref]				[Ref]			
Payment source=Public Insurance	0.863	(0.738,	1.008)	0.063	0.921	(0.824,	1.028)	0.143
Payment source=Self-Pay	0.996	(0.792,	1.253)	0.975	1.001	(0.835,	1.200)	0.994
Payment source=Other	0.801	(0.651,	0.986)	0.036	0.918	(0.754,	1.117)	0.392
ESI triage level=1	[Ref]				[Ref]			
ESI triage level=2	0.838	(0.248,	2.834)	0.776	0.763	(0.224,	2.596)	0.665
ESI triage level=3	0.481	(0.170,	1.363)	0.168	0.502	(0.174,	1.451)	0.203
ESI triage level=4	0.349	(0.107,	1.138)	0.081	0.438	(0.132,	1.456)	0.178
ESI triage level=5	0.315	(0.079,	1.255)	0.101	0.400	(0.098,	1.634)	0.202
Did not receive sedation procedure	[Ref]				[Ref]			
Received sedation procedure	1.429	(1.220,	1.675)	0.000	1.021	(0.841,	1.241)	0.832
Disposition=Discharge	[Ref]				[Ref]			
Disposition=Admission	1.592	(1.193,	2.124)	0.002	0.984	(0.767,	1.262)	0.898
Disposition=Transfer	1.340	(1.055,	1.702)	0.016	1.234	(1.079,	1.411)	0.002
Clinician type=Physician	[Ref]				[Ref]			
Clinician type=APP	0.546	(0.449,	0.665)	0.000	0.688	(0.583,	0.811)	0.000
Clinician type=Both 50/50	0.692	(0.482,	0.996)	0.047	0.731	(0.585,	0.914)	0.006
Pediatric volume, in 1000s	1.003	(0.990,	1.017)	0.622	0.991	(0.978,	1.003)	0.134

Notes: Confidence intervals estimated using standard errors clustered at the facility-level.