Open Fractures in Pediatric Orthopaedics – Can Pathways Improve Care?

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Background

- **Care pathways**
  - Evidence based algorithms to **optimize care**
  - Improve patient safety, outcomes, and value
  - Multidisciplinary approach is essential
- In the care of **open fractures**, time to administration of antibiotics has been shown to be the most critical factor in preventing infection.
- To help improve outcomes at our institution we designed and implemented **an open fracture pathway** with the goal being to reduce the time from emergency department **(ED) arrival** to **antibiotic administration.**
- Our goal was to determine if the implementation of the "Open Fracture Pathway" led to **a decrease in time** from ED admission to antibiotic administration?

Methods

- Study design
  - Retrospective pre-pathway cohort
  - Prospective post-pathway cohort
- Inclusion criteria
  - Patients 18 years of age and younger with open pelvic or extremity fractures
- Exclusion criteria
  - Spine, hand, foot fractures, penetrating trauma
  - Transfers from outside hospitals who received antibiotics prior to CHOP ED
- Outcomes
  - Primary
    - Timing
    - ED arrival → Antibiotics ordered
    - ED arrival → Antibiotics administered
  - Secondary
    - Correct antibiotic type based on GA severity
   - Time to surgical debridement

Pathway
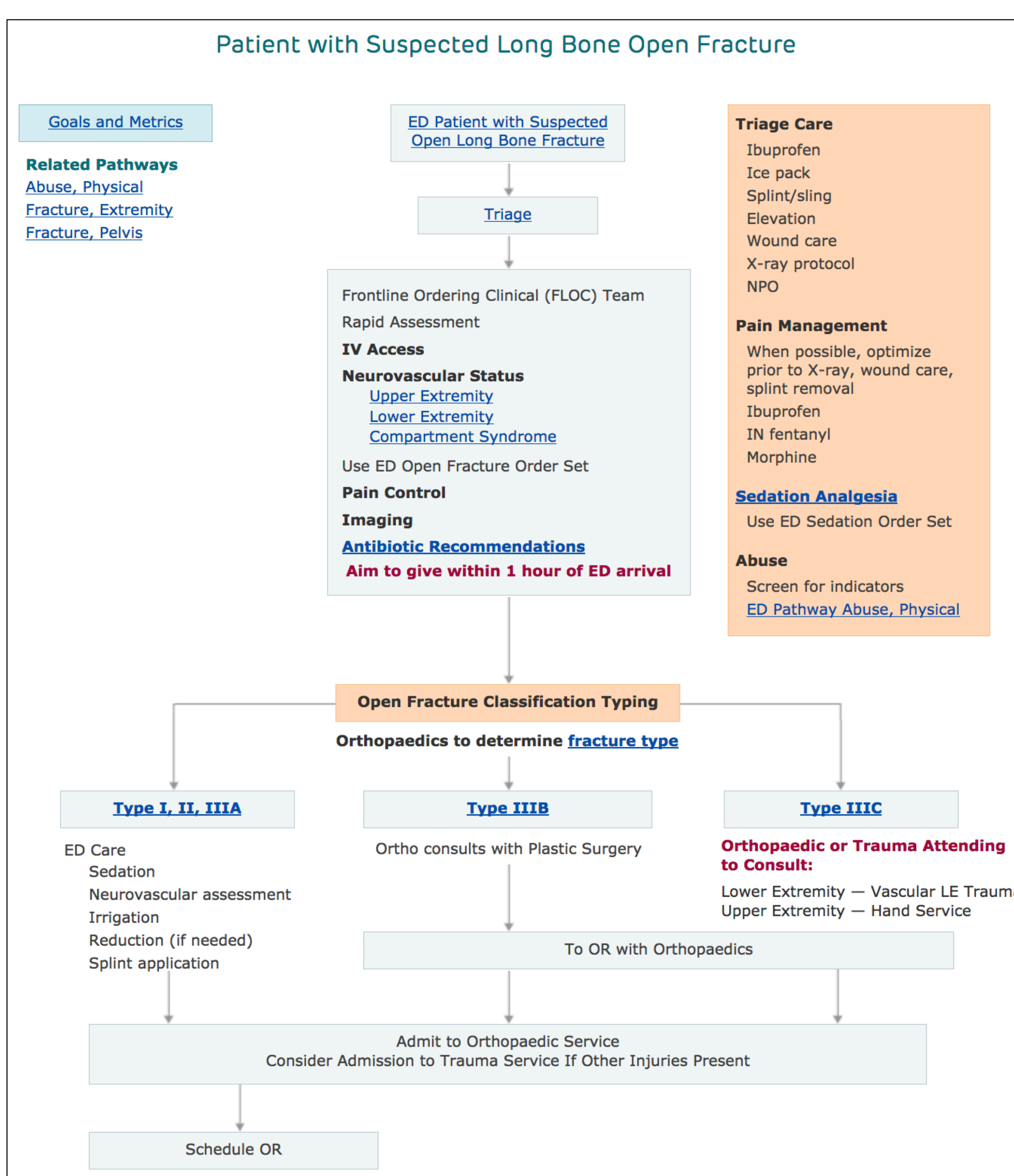
Results

Table 1. Patient Demographics and Fracture Characteristics

		Pre-pathway cohort n=27	Post-pathway cohort n=11	p-value
Age (yrs)		9.6 (8.6,10.6)	10.1 (6.7,13.6)	0.46
Gender				
	Female	8 (29.6%)	1 (9.1%)	0.237
	Male	19 (70.4%)	10 (90.9%)	
Laterality				
	Left	14 (51.9%)	5 (45.5%)	0.728
	Right	12 (44.4%)	6 (54.5%)	
	Bilateral	1 (3.7%)	0	
Fracture location				
	Bbffx	17 (63%)	6 (54.5%)	0.722
	Distal radius	2 (7.4%)	1 (9.1%)	
	Ulna/Monteggia	1 (3.7%)	0 (0.0%)	
	SCH	2 (7.4%)	0 (0.0%)	
	Femur	0 (0.0%)	1 (9.1%)	
	Tib/fib	5 (18.5%)	3 (27.3%)	
Gustilo type				
	1	22 (81.5%)	8 (72.7%)	0.667
	2	4 (14.8%)	3 (27.3%)	
	3	1 (3.7%)	0 (0.0%)	
Transfers from OSH		15 (55%)	2 (20%)	0.7

Table 2. Antibiotic Timing and choice

	Pre-pathway cohort n=27	Post-pathway cohort n=11	p-value
ED arrival to Abx order (min)	115.3 (85.0,145.5)	63.5 (32.5, 94.4)	0.016*
Abx order to Abx admin (min)	48.0 (32.6, 63.7)	35.7 (23.7,47.7)	0.191
ED arrival to Abx admin (min)	163.3 (133.0, 193.6)	99.2 (66.8, 131.5)	0.004*
Abx admin within 1 hour of arrival	3 (11.1%)	2 (18.2%)	0.615
Correct Abx choice	25 (92.6%)	11 (100%)	0.354
ED arrival to surgery (hrs)	12.0 (7.9,16.1)	11.4 (9.4, 13.4)	0.783
Surgery within 24hrs of ED arrival	27 (100%)	11 (100%)	0.999

Figure 1. Post-Pathway time to antibiotic order and administration
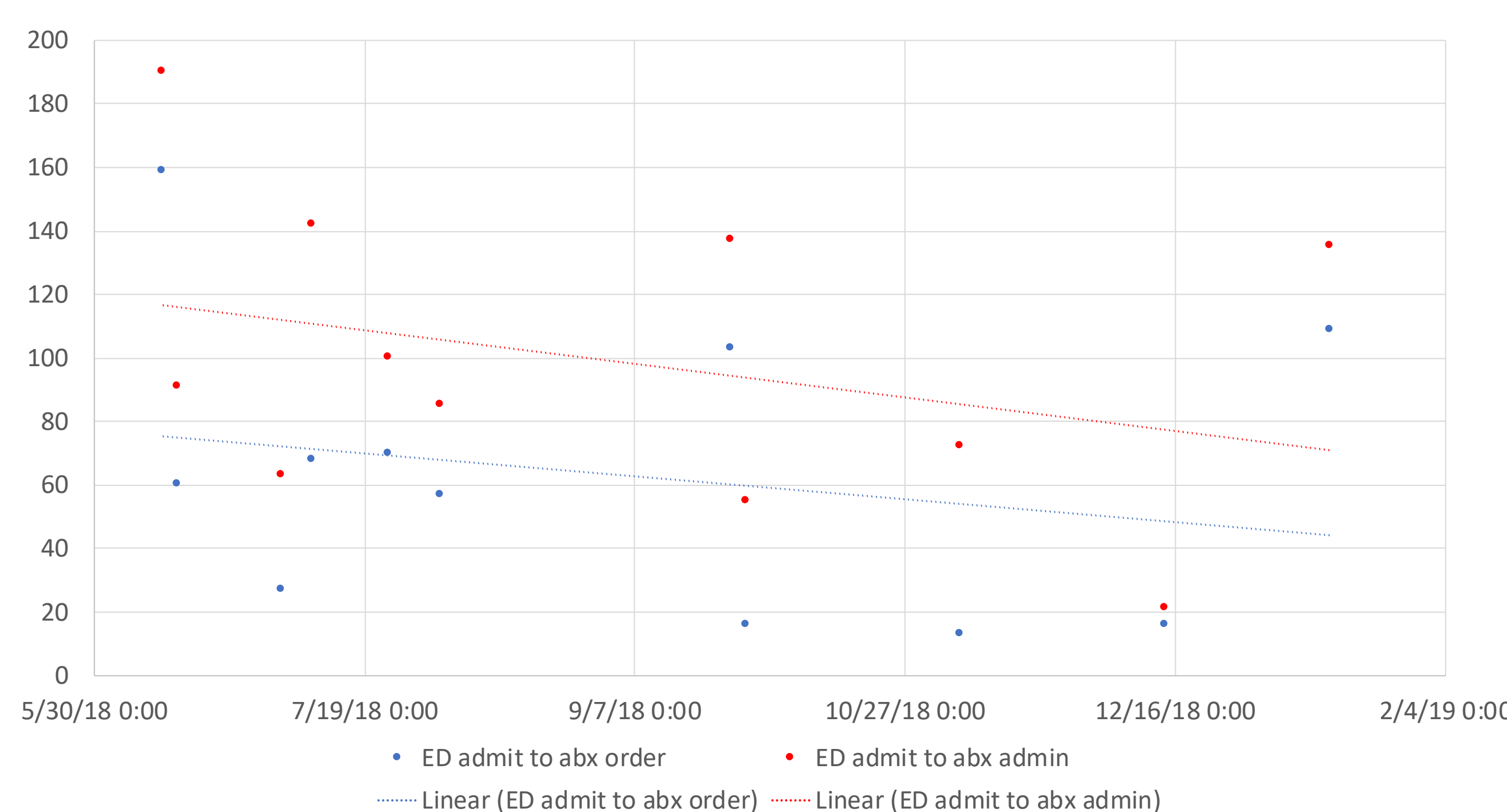
Results (Summary)

- **27 patients** in the **pre-pathway** cohort and **11** in the **post-pathway** cohort.
- No differences in demographics or fracture characteristics between cohorts.
- Majority of fractures included were **both bone forearm fractures**, and they were primarily **type 1 open injuries**
- Time from ED arrival to antibiotic order **decreased** from 115.3 minutes to 63.5 minutes (**p=0.016**).
- Time from antibiotic order to antibiotic administration was similar between groups (48.0 vs 35.7 minutes, p=0.191).
- Time from ED arrival to antibiotic administration **decreased** from 163.3 minutes to 99.2 minutes (p=0.004).
- No significant differences in whether the correct antibiotic type was chosen (p=0.354) or time from ED arrival to surgery (p=0.783).
- Antibiotic administration prior to transfer increased post-pathway
  - Pre-pathway – 23 of 38 transfers received antibiotics at OSH (60.5%)
  - Post-pathway – 18 of 20 transfers received antibiotics at OSH (90.0%) (p=0.032)

Discussions

- Pathways improvement – low hanging fruit
  - Working with pharmacy and ED nursing to decrease the times from antibiotic order to administration. There was improvement from 48 minutes to 35.7 minutes, which could still be improved.
  - For transfers from other hospitals, patients receiving antibiotics was not part of the formal protocol but still increased from 60.5% to 90%, which is possibly due to heightened awareness.
- Future steps
  - Continued patient data collection
  - **Formalize communication with outside facilities** prior to transfer into pathway
  - Present and discuss with trauma and ED teams

Conclusions

- Pathways can assist busy ED providers to **decrease time to administration of antibiotics** in the setting of pediatric open fractures.
- For patients presenting with **open fractures**, a **care pathway** can be successful in decreasing the time from ED arrival to antibiotic administration.

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