Improving Time to Operating Room for Pediatric Femoral Shaft Fractures: Does Success in this Quality Improvement Initiative Improve Patient Outcomes?

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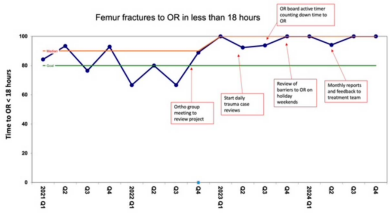
INTRODUCTION: In recent years, emphasis on timely fixation of pediatric femur fractures at major pediatric hospitals nationwide has increased. Current literature suggests that this may decrease length of stay, although it is unclear if there is significant impact on additional clinically relevant outcomes. In an effort to enhance patient care and as a justification to advocate for dedicated orthopedic trauma operating room time, a quality improvement (QI) initiative was established. The aim of this QI initiative was to ensure timely care of femur fractures, with the goal of operative treatment within 18 hours of presentation. Multiple interventions were implored to achieve this aim utilizing plan-do-study-act (PDSA) cycles. The primary objective of this study was to evaluate the impact of surgical timing, before and after implementation of this QI initiative while also evaluating if this resulted in a change in outcomes. The primary outcome measure was time to the operating room (OR) within 18 hours. Secondary outcomes included complication rates, intensive care unit (ICU) admission, and length of stay.

METHODS: A retrospective review of 289 pediatric patients with femoral shaft fractures from 2016-2024 was conducted at a single level 1 pediatric trauma center. Pre-intervention was defined as those patients treated prior to June of 2023. Post-intervention was defined as those patients treated beginning June 1, 2023 which corresponded with the initiation of this QI initiative. QI initiative interventions included meetings prior to initiation to discuss the project, initiation of daily trauma case reviews, creation of an OR board active countdown timer, visible to the entire surgical department, review of barriers to the OR on holiday weekends, review of barriers to OR with on-call team and new residents (Figure 1). Patient demographics and clinical data were obtained via chart review including age at time of surgery, time to operating room from time of presentation to the hospital, length of stay defined in days, requirement of ICU admission, and presence of any complications. Continuous data were evaluated with the Mann-Whitney U test. Categorical data were evaluated with Pearson's chi-squared or Fisher's exact test. Significance was set at an alpha value of 0.05.

RESULTS: Amongst the pediatric femoral shaft fractures in our study, 71% (205/289) constituted pre-intervention (Group 1) and 29% (84/289) were in the post-intervention group (Group 2). Prior to this intervention, 84% of patients were operated on within 18 hours of presentation compared with 95% of patients post-intervention (p=0.01). This represented a 3.7 times increased odds of taking longer than 18 hours to enter the operating room prior to intervention. Patients in Group 1 stayed in the hospital for an average of 2.3 days while patients in Group 2 stayed in the hospital for an average of 2.1 days (p=0.345). Complication rates in Group 1 were 5% compared to 8% in Group 2 (p=0.276). Thirty patients in Group 1 required ICU admission compared with 5 patients in Group 2 (p=0.047). (Table 1). When looking at time to OR, patients who were treated within 18 hours of presentation to the hospital versus after 18 hours, there were no differences in complication rates (6% vs 6%, p=1). With regard to ICU admissions by time to OR, 11% of those who were treated < 18 hours required ICU admission versus 22% of those who were treated > 18 hours (p=0.057). (Table 2). A post-hoc power analysis suggests that 175 patients are needed per cohort to determine significance for ICU admissions by time to OR.

DISCUSSION AND CONCLUSION: This quality improvement intervention was successful at improving the goal at outset, as marked by an increased percentage of femur fractures undergoing operative management within 18 hours of presentation. However, there were no differences in complication rates or ICU admissions. There was also no significant improvement in length of stay after implementation of this intervention. Limitations include those inherent to a retrospective study, a relatively low number of complications overall in the cohort, and a smaller sample of patients comparatively in the post-intervention group. Further research continues to be necessary to determine if this metric is relevant to patient outcomes and worthy of the resources required to implement it.



Demographics	Pre	Post	Significance
	N=205	N=84	
Age	7.2	6.8	0.702
Sex (M)	154	62	0.816
Closed Fracture	204	82	0.203
Time to OR (hours)	12	12.1	0.61
Time to OR (18 hr cut-off)			**0.01**
< 18 hours	173	80	
> 18 hours	32	4	
LOS (days)	2.3	2.1	0.345
Type of Fixation			
Spica	107 (52%)	41(49%)	
Flex Nail	31 (15%)	19 (22.5%)	
Plate	12 (6%)	5 (6%)	
Rigid Nail	48 (23.5%)	19 (22.5%)	
Other	7 (3.5%)	0 (0%)	

Outcomes	< 18 hours	> 18 hours	Significance
	N=253	N=36	
Any complication	15	2	p=1
ICU admission	27	8	p=0.057