

# Pediatric Orthopedic Trauma at a Level II Trauma Center: Benefits of Coverage by Traumatologists

Dietrich Riepen, MD<sup>1</sup>, Joseph Gardner, BS<sup>2</sup>, Nicholas Mannering, BSN, MBA<sup>3</sup>, Pierce Johnson, MD<sup>1</sup>, Peter Althausen, MD, MBA<sup>1</sup>

1) Reno Orthopedic Center 2) University of Nevada School of Medicine 3) Renown Regional Medical Center

**Objectives:** Compare implant costs, case duration, and rates of unplanned return to the operating room between pediatric trauma cases performed by fellowship-trained orthopedic traumatologists and those by fellowship-trained pediatric orthopedists.

**Design:** Retrospective comparative cohort study.

**Setting:** Non-academic, Level II trauma center

**Patients/Participants:** Trauma and fracture cases involving patients aged 18 or younger were identified over a 20-month period (1/1/23-8/31/24).

**Intervention:** Surgical treatment for traumatic orthopedic injury.

**Main Outcome Measurements:** Cases managed by four private practice traumatologists were compared with similar cases handled by two hospital-employed pediatric orthopedists. Cases were considered similar if they shared the same CPT code, fracture type, means of reduction, and manner of fixation. Mean implant costs, case duration (from incision to closure), and unplanned returns to the operating room were compared statistically.

**Results:** Three hundred seven pediatric trauma cases were identified, including 246 by traumatologists and 61 by pediatric orthopedists. Twelve similar case types were classified: proximal humerus open reduction internal fixation (ORIF), supracondylar humerus closed reduction percutaneous pinning (CRPP), medial epicondyle ORIF, lateral condyle ORIF, radius and/or ulna shaft ORIF, distal radius CRPP, slipped capital femoral epiphysis CRPP, flexible femoral shaft nailing, distal femur ORIF, tibial tubercle ORIF, rigid tibial nailing, and ankle ORIF. See Figure 1 for details.

In 9 of 12 case types, traumatologists had lower implant costs and shorter case durations. When average implant costs were combined, trauma surgeons used implants that were 52% cheaper than those used by pediatric surgeons. Pediatric surgeons took 35% longer than trauma surgeons,

on average, for these 12 case types. Unplanned reoperation rates were similar between the two groups.

**Conclusions:** For comparable pediatric trauma cases, traumatologists completed cases 26% faster with 52% cheaper implants than pediatric orthopedists, with a lower unplanned reoperation rate. Pediatric trauma coverage by traumatologists may improve hospital resource allocation, enhance OR utilization, and provide financial benefits to patients and the healthcare system, while allowing pediatric orthopedists to focus on their elective practices.

**Level of Evidence:** Level III: Retrospective comparative cohort study at a single Level II trauma center.

**Keywords:** Pediatric trauma, orthopaedic traumatologist, pediatric fractures, implant cost, healthcare resource utilization, cost-effectiveness, operating room efficiency.

## INTRODUCTION

At many hospitals with trauma designations, pediatric fracture care is provided by fellowship-trained orthopedic traumatologists or fellowship-trained pediatric orthopedists, depending on the facility. In many cases, both fellowships include training in pediatric fracture care.

Hospitals with trauma designations must undergo review by the American College of Surgeons (ACS) to maintain their certification. This process is lengthy and detailed, during which patients are entered into the ACS database. Trauma programs are evaluated every 3 years, and the Trauma Quality Improvement Project (TQIP) provides benchmark data for hospitals to compare performance metrics. The Spring 2023 Pediatric TQIP Benchmark Report is based on admissions from 2020, 2021, and the first three quarters of 2022. It included 161 TQIP centers and a total of

Table 1. Comparison of Similar Case Types

Case Type	Volume		Avg Implant Cost ( \$ )			Avg Duration (mins)		
	Trauma	Pedi	Trauma	Pedi	<i>p</i>	Trauma	Pedi	<i>p</i>
Supracondylar Humerus CRPP	60	7	7	8	0.83	19	29	0.25
Radius or Ulna Shaft ORIF*	27	5	612	749	0.08	36	43	0.08
Ankle ORIF	22	9	490	693	0.37	43	51	0.29
Distal Radius CRPP	19	11	<b>5</b>	<b>3</b>	<b>0.01</b>	17	21	0.23
Tibia IMN	15	2	1087	3815	0.44	<b>55</b>	<b>83</b>	<b>0.01</b>
SCFE CRPP	5	6	219	415	0.11	34	31	0.76
Medial Epicondyle ORIF	4	6	<b>49</b>	<b>328</b>	<b>0.02</b>	32	50	0.09
Lateral Condyle ORPP	6	1	5	4	0.35	41	31	0.08
Distal Femur ORIF	5	1	<b>1053</b>	<b>1958</b>	<b>0.01</b>	79	81	0.36
Tibial Tubercle ORIF	5	1	1008	1232	0.07	<b>40</b>	<b>69</b>	<b>0.01</b>
Femur Shaft IMN**	3	1	329	325	0.17	44	38	0.27
Proximal humerus ORIF	1	1	<b>26</b>	<b>650</b>	<b>0.01</b>	<b>27</b>	<b>103</b>	<b>0.01</b>

Legend: ORIF = open reduction internal fixation; CRPP = closed reduction percutaneous fixation; IMN = intramedullary nail

\*(per bone) \*\* (elastic nails only)

127,575 admissions that met TQIP criteria for inclusion and exclusion.

During the review of Spring 2023 TQIP data on Level II trauma centers, it became clear that the trauma system under study was functioning at a high level. With 4800 annual trauma activations, the median time to OR for fixation of femur fractures was 4.28 hours compared to 13.54 hours at all hospitals. The median time to OR for fixation of open tibia fractures was 3.28 hours versus 7.7 hours at all hospitals (Spring 2023 Pediatric TQIP Benchmark Report ID: 1162). It was unusual for a Level II non-academic trauma center to perform so efficiently, prompting further investigation. We aimed to identify the factors within this trauma system that enabled such performance, hoping that insights from our analysis could benefit both clinical practice and economic aspects of other academic and nonacademic trauma systems.

Table 2. Reoperation Rates

	Traumatologists	Pediatric	<i>p</i>
Unplanned	9/172 (5.2%)	4/51 (7.8%)	0.50
Planned	10/172 (5.8%)	4/51 (7.8%)	0.53
Total	19/172 (11.0%)	8/51 (15.7%)	0.46

At the facility under study, the following characteristics were observed:

- Fellowship-trained traumatologists cover all trauma call.
- 30-minute response time required by ACS guidelines.
- A dedicated orthopedic trauma operating room is available daily from 0700 to 1900.
- On-call traumatologists cannot be encumbered by elective surgery or clinics.
- Hospital-employed pediatric orthopedists also fix fractures at the facility.

This study compared surgical duration, implant costs, and the rate of unplanned return to the operating room (RTOR) between fellowship-trained traumatologists and fellowship-trained pediatric orthopedic surgeons at a single non-academic level II trauma center.

## METHODS

Following the investigational review board exemption, a 20-month study period was established from January 1, 2023, to August 31, 2024. The

hospital's trauma database and surgical schedule were reviewed to identify all patients under 18 who underwent orthopedic fracture surgery.

Querying the Epic OR database enabled the collection of case data, including CPT codes, surgeon, case duration (from skin incision to closure), and implant costs. Charts were examined for operative details, imaging studies, and identification of unplanned reoperations.

Pediatric trauma cases performed by four private-practice traumatologists were compared with similar cases managed by two hospital-employed pediatric orthopedists. Case types were deemed similar if they had identical CPT codes, comparable fracture types, similar methods of reduction (open vs. closed), and manner of fixation (internal vs. percutaneous). Patients were excluded from the comparison if no matching case type was performed in the study period by the other group of surgeons.

Implant costs and case duration were reported using average values and compared between groups with t-tests. Unplanned reoperation rates were reported using percentages and compared with Fisher's exact tests. The significance level was set at 0.05. The statistical software used was SPSS 25.0.

## RESULTS

During the study period, three hundred seven pediatric trauma cases were identified. Traumatologists performed 246 surgeries, while pediatric orthopedists carried out 61. Twelve similar case types treated by both groups of surgeons were identified: proximal humerus open reduction internal fixation (ORIF), supracondylar humerus closed reduction percutaneous pinning (CRPP), medial epicondyle ORIF, lateral condyle ORIF, radius and/or ulna shaft ORIF, distal radius CRPP, slipped capital femoral epiphysis CRPP, flexible femoral shaft nailing, distal femur ORIF, tibial tubercle ORIF, rigid

tibial nailing, and ankle ORIF. These twelve case types involved 172 patients treated by traumatologists and 51 patients treated by pediatric orthopedists. Eighty-four patients were excluded because their cases were unique and could not be compared based on the treating surgeon's fellowship training.

For 9 of the 12 similar case types, traumatologists had lower implant costs and shorter case durations. When averaging implant costs across these 12 case types, trauma surgeons used implants that were 52% cheaper than those used by pediatric surgeons. Pediatric surgeons also took 35% longer than trauma surgeons, on average, for these case types. The comparison of these twelve similar case types is shown in Table 1.

Traumatologists had a lower rate of unplanned reoperations compared to pediatric orthopedists (5.2% vs. 7.8%), but this difference was not statistically significant. Reoperations were classified as unplanned if there was no documentation indicating a planned reoperation or if the clinical situation was clearly unplanned. Reasons for unplanned reoperations included symptomatic implants, delayed union, malunion, and refracture after union. There was also no significant difference between the two groups in planned or overall reoperation rates. Reoperations were considered planned if there was documentation in the chart indicating a plan to remove hardware. Planned reoperations were solely due to patient and/or surgeon preference based on the clinical situation. Reoperation data is summarized in Table 2.

The cost of OR time per minute varies greatly among institutions, specialties, and calculation methods, with estimates ranging from \$16 to \$133 per minute<sup>1-2</sup>. Assuming a cost of \$50 per minute for OR time, traumatologists saved the hospital approximately \$4128 per case compared to pediatric orthopedists for an

average tibial nail, mainly due to lower implant costs and shorter procedure durations.

Notably, a review of all case logs from the study period, including non-pediatric trauma cases, revealed that each traumatologist managed an average of 744 cases annually, while each pediatric orthopedist handled an average of 151 cases per year.

## DISCUSSION

For comparable pediatric trauma cases at this single Level II trauma center, traumatologists completed cases 26% faster and used 52% less costly implants than pediatric orthopedists, with a lower but statistically similar unplanned reoperation rate.

Previous studies have shown that fellowship-trained orthopedic traumatologists treat<sup>18</sup> common operative orthopedic injuries more quickly and at a lower cost than orthopedists with training in other subspecialties, including pediatrics<sup>3</sup>. Data from our study support the previous finding that traumatologists perform surgery faster and more cost-effectively across most of the fracture patterns examined.

These results may not be applicable to all trauma systems, especially those lacking a culture of efficiency in the operating room or an emphasis on cost containment. Part of the success of traumatologists in this trauma system in reducing costs stems from the use of high-value, FDA-approved orthopedic implants, which often cost less than half as much as traditional, name-brand orthopedic implants.

This Level II trauma system is also unique in that all trauma call is covered by orthopedic traumatologists rather than orthopedic surgeons with fellowship training in other subspecialties. All adult and pediatric orthopedic consults from the hospital and emergency room are managed by the trauma team. According to ACS rules, these trauma surgeons have no other clinical duties or elective cases on the day of their

trauma call, which could delay ER-to-OR times. Elective surgeons often schedule ER or fracture patients at the end of the day, potentially delaying patient care. Short ER-to-OR times improve patient outcomes<sup>4-6</sup> and are crucial in cases such as femur fractures, dislocations, fractures with associated vascular injury, and compartment syndrome.

A key element of ACS success is having a dedicated orthopedic trauma operating room available daily. This ensures that on-call physicians can prioritize pediatric trauma and fracture cases as needed. Multiple studies demonstrate that such an OR setup improves efficiency for both patients and surgeons alike<sup>7-11</sup>. The dedicated orthopedic trauma room at this Level II center averages over 75% utilization.

The reason for the improved operative times among trauma surgeons compared with pediatric surgeons may be partly due to more practice, as shown by the significant difference in annual surgical case volumes. Review of all case logs (not just pediatric trauma) from the study period revealed that private-practice traumatologists performed an average of 744 cases per year, while hospital-employed pediatric orthopedists averaged 151 cases per year. Multiple studies have shown that larger case volumes lead to greater efficiency<sup>12-13</sup>.

Another factor that may explain the improved efficiency and productivity is that the four traumatologists are in private practice, whereas the pediatric orthopedic surgeons are employed by the hospital. Depending on contract specifics, employed surgeons might not have the same incentives to work harder or faster as private practice surgeons. At least one previous study found that private practice vascular surgeons were significantly more likely to provide patient care for >40 hours per week than employed vascular surgeons<sup>14</sup>. Although the hospital in this study might lose some surgical case revenue if its employed

pediatric orthopedists do not treat pediatric fractures and this privilege is assigned to contracted traumatologists, the savings from reduced implant costs and shorter case durations probably outweigh the lost case revenue.

Implant costs vary significantly across our dataset between trauma and pediatric surgeons for treating similar injuries. Our trauma service has used high-value, FDA-approved implants (Orthopedic Implant Company, Reno, NV) for over ten years. In contrast, pediatric orthopedic surgeons rely on conventional implants (Orthopediatrics, Warsaw, IN), which are considerably more expensive despite multiple studies showing comparable clinical outcomes<sup>15-17</sup>.

Previous studies also indicate that elective orthopedic practices benefit when traumatologists handle hospital and emergency room calls. A study by Althausen et al. found that elective orthopedic partners saw more patients in clinic, performed more surgeries, and took more vacation and less call with coverage by traumatologists<sup>18</sup>. This data suggests that hospital pediatric orthopedic surgeons could focus on expanding their elective practices, such as elective scoliosis, hip dysplasia, congenital deformities, and other pediatric orthopedic conditions. This approach allows pediatric trauma patients to reach the operating room faster with traumatologists trained in fracture management, while elective pediatric patients gain better access to pediatric orthopedic surgeons in clinics. Increasing elective work for pediatric surgeons would lead to improved financial stability for both their practices and the hospitals that employ them.

### CONCLUSION

The data from this study demonstrate the benefits of having fellowship-trained traumatologists manage pediatric fracture care. For comparable pediatric trauma cases, traumatologists completed surgeries 26% faster and with 52% lower implant costs than pediatric orthopedists, with reoperation rates that were statistically

similar. Pediatric trauma coverage by traumatologists may enhance hospital resource allocation, optimize OR utilization, and provide financial benefits to patients and the healthcare system, while allowing pediatric orthopedists to focus on their elective practices. This arrangement can benefit surgeons, hospitals, and patients from efficiency, financial, and patient perspectives.

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