Impact of Transitioning to a Level I Trauma Center on Orthopaedic Surgical Volume and Resident Education: A Retrospective Analysis

Darlington Nwaudo[1], Solomon Tabe Egbe, Audrey Litvak, Jason Strelzow
[1]University of Chicago

INTRODUCTION:

Orthopaedic residents must complete a minimum of 1000 surgical cases during their 5-year residency, encompassing specific procedural categories as mandated by the Accreditation Council for Graduate Medical Education (ACGME). In 2018, our institution transitioned from an adult Level III to a Level I trauma center (L1TC). This study examines the impact of transitioning a major academic medical center to an L1TC on orthopaedic surgical volume, complexity, and residents' educational experience.

METHODS: We retrospectively reviewed resident reported ACGME case logs and electronic medical records (EMR) for orthopaedic surgeries performed at a single urban institution from July 1, 2013, to June 30, 2023. Data were divided into pre-L1TC (2013-2018) and post-L1TC (2018-2023) periods. We evaluated this experience using two metrics: ACGME Trauma logs (reported by residents) and Trauma cases as reported by the institutional EMR. Trauma logs were identified based on ACGME criteria involving CPT codes within the “fracture and/or dislocation” and “manipulation” categories. Trauma cases were identified based on strict surgical criteria including; procedures performed by fellowship-trained trauma surgeons, occurring on weekends or holidays, or being designated as emergent, urgent, or semi-urgent. All other surgical cases were considered elective. Statistical analyses were conducted using parametric linear regressions to evaluate trends in case volumes.

RESULTS:

The total number of ACGME cases logged yearly fluctuated from 6172 in 2015 to 10,541 in 2018, with no significant trend over the study period ($p=0.17$). Post-L1TC ACGME trauma logs increased significantly ($p=4.25 \times 10^{-4}$), averaging 2586 (31.1% of all logs) compared to 1467 (21.6% of all logs) pre-L1TC. Trauma case volume (EMR data) experienced an 11.6-fold increase post-L1TC ($p=1.375 \times 10^{-5}$). Elective surgical cases remained largely stable across the 10-year study period ($p=0.48$). Notably, when exclusively examining the trend in pre-pandemic academic years (2014-2019), we observed a significant increase in elective case volume ($p=0.0035$). Utilizing this regression to predict expected elective cases in “normal” academic years, we observed an average of 30% decline in elective cases in post-pandemic academic years (2020-2022).

DISCUSSION AND CONCLUSION: Transitioning to an L1TC significantly increased resident reported ACGME trauma logs and institutional orthopaedic trauma cases. Total ACGME cases logged did not significantly change, likely due to shifts in logging behavior and the predominance of trauma cases meeting procedural requirements. The COVID-19 pandemic impacted elective surgical volumes but not trauma cases, underscoring the critical role of L1TC access in maintaining surgical education and experience during disruptions. Future research should explore how L1TC training influences early career competence, knowledge and skill development, and proficiency in orthopaedic surgeons. Our findings highlight the importance of trauma center access in shaping resident training and the need for ongoing investigations to optimize surgical education.

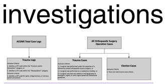

Figure 1. Cohort Selection. ACGME = Accreditation Council for Graduate Medical Education.

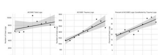

Figure 2. Trend in ACGME case logs and percent trauma across the study period 2014-2023. Pre-L1TC: July 1, 2013 - April 30, 2018. Post-L1TC: May 1, 2018 – End of study period. Confidence intervals (95%) are depicted.

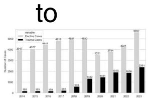

Figure 3. Frequency of all orthopaedic surgery operative cases across the study period 2014-2023. Pre-L1TC: July 1, 2013 - April 30, 2018. Post-L1TC: May 1, 2018 – End of study period.

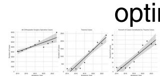

Figure 4. Trend in all orthopaedic surgery operative cases and percent trauma across the study period 2014-2023. Pre-L1TC: July 1, 2013 - April 30, 2018. Post-L1TC: May 1, 2018 – End of study period. Confidence intervals (95%) are depicted.

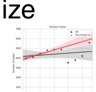

Figure 5. Trend in orthopaedic surgery elective operative cases across the study period 2014-2023 and pre-COVID-19 Pandemic. Pre-L1TC: July 1, 2013 - April 30, 2018. Post-L1TC: May 1, 2018 – End of study period. Confidence intervals (95%) are depicted.

Table 1. ACGME case logs by academic year.

Academic Year	ACGME Total Logs	ACGME Trauma Logs	Percentage Trauma
2014	6495	1309	20.15%
2015	6172	1282	20.77%
2016	6298	1538	24.42%
2017	7696	1739	22.60%
2018	10541	2093	19.86%
2019	8999	2081	23.12%
2020	8364	2460	29.41%
2021	8807	3091	35.10%
2022	8075	2927	36.25%
2023	7492	2369	31.62%

ACGME = Accreditation Council for Graduate Medical Education

Table 2. Percent reduction in elective case volume.

Academic Year	Elective Cases (Predicted)[a]	Elective Cases (Observed)	Percent Reduction[b]
2020	5259.84	3521	33%
2021	5473.1	3794	31%
2022	5686.36	4221	26%
2023	5899.62	5597	5%

[a] Determined via linear regression analysis.
[b] Percent reduction in observed number relative to predicted value of elective cases.