Implementation of a Trauma Zone Improves Disposition Time for Patients with Intracranial Hemorrhage or Hip Fracture

By: Darshak Vekaria, MD, Tenzin Oshoe, Adam Bilig, Dr. Samita Heslin

Abstract

- Introduction: Stony Brook University Hospital is a Level 1 Trauma Center in Suffolk County, NY that sees a wide variety of pathology, including trauma. The department designated one its three zones to be a Trauma Zone on 8/1/2019. We hypothesized that the implementation of a Trauma Zone would lead to several beneficial outcomes in ED throughput.
- Methods: Retrospective review of patients with intracranial hemorrhage (ICH) or hip fractures triaged into one of the Acute Zones in the summer months of 2019 and 2020.
- Analysis: The average time to clinician, average time to disposition, and average ED length of stay were decreased to a statistically significant level compared to similar metrics obtained pre-implementation
- Discussion: The implementation of a Trauma Zone in the ED of a Level 1 Trauma Center is associated with significant improvement in ED throughput times for patients presenting with intracranial hemorrhage or hip fractures.

Introduction

- Stony Brook University Hospital is a level 1 Trauma Center in Suffolk County, New York. The Emergency Department (ED) sees more than 100,000 patients annually. The ED consists of Acute Zones (Red, Blue, and Green) and a singular Critical Zone and patients are triaged to corresponding zones based on Emergency Severity Index (ESI). Prior to the implementation of a Trauma Zone, patients with an ESI of 2, 3, or 4 were seen in any of the Acute Zones. However, on August 1st, 2019, the Green Zone became a designated Trauma Zone and patients who presented after sustaining traumatic injuries were triaged to Green. This restructuring aimed to streamline the flow of non-critical trauma patients ensuring that they receive specialized care promptly. With this strategic allocation of resources, the ED reaffirms its commitment to delivering high quality care. We hypothesized that the implementation of the Green Zone would lead to several beneficial outcomes, including faster patient evaluation and imaging, shorter ED lengths of stay, and decreased time to intervention, among other outcomes

Materials & Methods

- Retrospective review of patients triaged to an Acute zone between May, June, and July 2019 (pre-implementation) and May, June, and July 2020 (post implementation) and diagnosed with ICH or hip fracture.
- While reviewing the charts, key data points were recorded. These included the following:
  - » Time to MD (time from ED arrival to encounter with provider)
  - » Time to Diagnosis (time from ED arrival to radiological diagnosis)
  - » Time to Disposition (time from ED arrival to time of admission order)
  - » ED Length of Stay (time from ED arrival to placement to inpatient bed)
  - » Hospital Length of Stay (time spent on inpatient units)
  - » Overall Length of Stay (ED length of stay + Hospital length of stay)
  - » Time to Operating Room (OR): (Time from ED arrival to arrival to OR)
  - » Level of Care received (ICU vs ICR vs General Floor)
- Fisher's exact test was used to compare the data obtained from the chart review.

Results

Table 1

Event (Hours)	Pre-Trauma zone Mean (SD)	Post -Trauma zone Mean (SD)	Difference (95% CI)	P
Time to Clinician	2.24 (2.30)	0.99 (0.98)	1.24 (0.51 – 1.98)	.001
Time to disposition	8.07 (3.66)	5.52 (2.60)	2.54 (1.29 – 3.81)	<.001
Time to diagnosis	5.10 (3.99)	4.86 (2.93)	0.23 (-1.05 – 1.52)	.72
ED LOS	21.42 (16.80)	11.67 (3.60)	9.75 (4.58 – 14.92)	<.001
Inpatient LOS	126.33 (81.95)	159.51 (114.88)	-33.18 (-72.56 – 6.20)	.10
Overall Hospital LOS	148.29 (81.76)	171.18 (114.83)	-22.88 (-62.22 – 16.46)	.25
Time to OR (N=30/48)	32.06 (24.06)	30.91 (20.27)	1.14 (-8.96 – 11.25)	.82

Table 1: 115 patients medical records were reviewed with 44 (38%) patients in the pre-Trauma Zone (pre TZ) group and 71 (62%) in the post-Trauma Zone (post TZ) group. Tables contain comparisons of the endpoints and all times are in hours.

Table 2

Event	PRE-TRAUMA ZONE (%)	POST-TRAUMA ZONE (%)
INTRACRANIAL HEMORRHAGE (n= 31)	39 (12/31)	19 (61%)
Hip Fracture (n = 84)	38 (32/84)	62 (52/84)
Operative Intervention (n = 78)	38 (30/78)	62 (48/78)

Table 2: Comparison of the total number of each diagnosis seen between both groups and the number of patients receiving operative intervention in each group.

- The mean time to clinician was significantly lower in the post-trauma group (0.99 hrs) compared to the pre-Trauma Zone (2.24 hrs) (p= 0.001)
- Similarly, the post-Trauma Zone had a time to disposition of 5.52 hours while the pre-Trauma Zone had an average time of 8.07 hours (p < 0.001)
- Post-Trauma Zone ED length of stay was 11.67 hours on average. Pre-Trauma Zone ED length of stay mean was 21.4 hours. This was significant to a p < 0.001
- Time to diagnosis, inpatient length of stay, and overall hospital length of stay did not see any significant difference.

Discussion

- The implementation of a Trauma Zone in the ED of a large Level 1 Trauma Center is associated with significant improvement in ED throughput times for patients presenting with ICH or hip fractures.
- When reviewing the data, time to clinician, time to disposition, and ED length of stay were significantly improved with the implementation of the Trauma Zone when compared to similar metrics analyzed in the pre-implementation group.
- The reduction in time to clinician suggests that patients were evaluated by medical professionals more promptly after arrival, potentially leading to earlier diagnostic assessments and treatment initiation. This is particularly crucial for conditions such as ICH and hip fractures, where timely intervention can significantly influence patient outcomes and mitigate complications.
- However, further research is warranted to explore the sustainability of these improvements over time and to assess the impact of the Trauma Zone on broader aspects of trauma care delivery, including patient outcomes and healthcare provider satisfaction.
- Future studies can also assess if there is similar impact on other non-critical trauma diagnoses.

References & Special Thanks

1. Jacobs, L. M., Sinclair, A., Beal, A. L., & Pranikoff, T. (2016). Improving trauma outcomes through use of a dedicated trauma resuscitation area. Journal of Trauma and Acute Care Surgery, 81(3), 458-463.
2. MacKenzie, E. J., Rivara, F. P., Jurkovich, G. J., Nathens, A. B., Frey, K. P., Egleston, B. L., & Salkever, D. S. (2006). A national evaluation of the effect of trauma-center care on mortality. New England Journal of Medicine, 354(4), 366-378.

Special Thanks to:
1. Dr. Samita Heslin & Dr. Erika Newton
2. Dr. Henry Thode
3. Dr. Scott Johnson
4. My loving family and wife, Dhriti.