Impact of a Full-Scale Mass Casualty Exercise on Emergency Department Operations at a Level One Trauma Center and Academic Referral Hospital

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Background

- Emergency departments must be prepared for sudden surges of critically ill patients.
- To maintain readiness, U.S. hospitals conduct full-scale mass casualty exercises (FSE), though few studies examine their impact on real-time patient care in active EDs.
- This program evaluation addresses this gap by analyzing the operational impacts. of an FSE conducted at the University of Colorado Hospital (UCH), a major academic U.S. hospital and level one trauma center.
- On a Wednesday morning, 78 volunteer patients with mock injuries tested the UCH ED's surge capacity with a layered staffing model simulating disaster response demand.

Methods

- The FSE was operationalized through deliberate communication strategies, comprehensive advance planning, and the strategic layering of additional staff beyond routine clinical coverage.
- The exercise occurred on a Wednesday in September between the hours of 8:00 and 11:30 a.m. Data was collected from the EMR on the exercise day and on four preceding and four following Wednesdays, which served as control days.
- Data was collected across two time periods: Exercise Hours and the Full Clinical Shift. To account for potential spillover effects of set-up and extra crowding, "Exercise Hours" were defined as 6:00 a.m. to 12:00 p.m. and analyzed separately from the full Clinical Shift (6:00 a.m. to 8:00 p.m.).
- Data collected included the primary outcome of 'ED length of stay (LOS)', and secondary outcomes, including 'Arrival to Destination', 'Arrival to Provider Assigned', and 'Arrival to Disposition Decision', all measured in minutes.
- Outcome variables were highly skewed count data with substantial variability, so they were modeled using negative binomial regression to account for overdispersion.

Results

- Overall, there is no evidence that the exercise affected LOS or 'Arrival to Disposition Decision.'
- 'Arrival to Provider Assigned' was shorter on the exercise day.
- 'Arrival to Destination' was not impacted during Exercise Hours but was shorter during the full Clinical Shift on the exercise day.
- We did not observe a statistically significant impact on ED LOS across exercise hours or the impacted clinical shift. As a metric for ED throughput, LOS was chosen as the primary outcome to evaluate whether the exercise had a detrimental effect on real patients in the ED.
- Despite the added mental and emotional strain on clinical teams due to managing patients in the midst of an active FSE, real patients present in the ED during the time of the exercise or the impacted clinical shift did not experience overall delays in care.

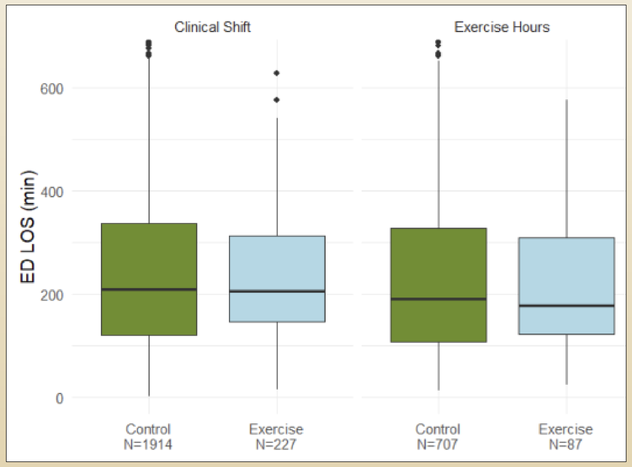

Table 2: Negative Binomial Regression Outcomes by Day

		Mean	P-Value
Exercise Hours			
ED LOS (min)	Control	124	0.4266
	Exercise	132	
Arrival to Disposition Decision (min)	Control	467	0.5707
	Exercise	497	
Arrival to Provider Assigned (min)	Control	4.79	0.0035
	Exercise	3.77	
Arrival to Destination (min)	Control	21.0	0.3611
	Exercise	19.0	
Clinical Shift			
ED LOS (min)	Control	90.1	0.8177
	Exercise	91.3	
Arrival to Disposition Decision (min)	Control	107	0.6442
	Exercise	110	
Arrival to Provider Assigned (min)	Control	6.84	0.0003
	Exercise	5.68	
Arrival to Destination (min)	Control	7.75	0.0208
	Exercise	2.90	

Conclusions

- This program evaluation demonstrates that MCI drills can be performed in active EDs without affecting clinical operations and, thereby, impact on real patient care.
- With appropriate preparation and staffing, ED leadership can confidently participate in FSEs without risking negative impacts on real patient care.
- Existing literature surrounding the effect that these drills may have on real patient care is sparse, and this program evaluation of the UCH FSE and its potential effect on patient throughput should serve as further evidence of the feasibility of effectively performing large scale exercises alongside routine ED operations.

Future Directions

- Future studies should expand on this clinical metric evaluation and assess real patient outcomes, return visits, and clinician cognitive load for a more comprehensive evaluation of FSE impacts on EDs.

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