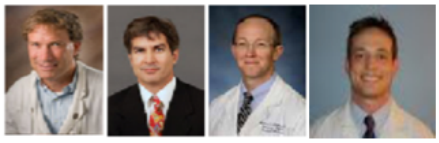
critical care perspectives in emergency medicine



ED-ICUs – Do They Decrease Mortality or ICU Admission Rates?

Key Article

- *Gunnerson KJ, et al. Association of an emergency department-based intensive care unit with survival and inpatient intensive care unit admissions. JAMA Network Open. 2019*

Background

- Critical illness and injuries account for 40% of total annual US hospital costs and $260 billion in annual costs.
- Many health care systems face increased patient acuity, decreased ICU availability, and a shortage of ICU physicians. This has placed a greater demand to deliver critical care in the ED.
- The total annual hours of critical care delivered in US EDs increased more than 200% from 2001-2009.
- Numerous studies demonstrate an association between increased ED boarding time and worse outcomes for critically ill patients.
- In response to the current challenges, some health-care systems have implemented ED-based ICUs – to optimize critical care delivery outside of the traditional ICU model.
- Michigan – constructed and implemented their Emergency Critical Care Center (EC3).

Objective

- Examine patient outcomes and resource use before and after implementation of EC3.

Study

- Retrospective cohort analysis from the University of Michigan
    - Academic medical center with approximately 75,000 ED visits per year
    - EC3
        - 5 resuscitation and trauma bays
        - 9 inpatient rooms
        - Adjacent to the ED
        - Staffed by EM physicians (with or without CC training), EM residents and fellows, physician assistants with CC training, ED nurses with ICU training, RTs, and pharmacists
        - Patient to nurse ration 2:1
    - All ED patients initially evaluated and treated by the main ED team.
    - Prior to EC3, patients would remain in their ED rooms until an ICU bed became available.
    - After EC3, patients could be transferred for by the EC3 team and cared for in the 9 bed ED-ICU
    - Common indications include: severe sepsis or septic shock, altered mental status, OD, major electrolyte disturbance, DKA, GI bleed, respiratory distress or failure, CHF and undifferentiated shock/hypotension.
- Pre-EC3 cohort: all visits to the ED from 9/2/12 to 2/15/15

- Post-EC3 cohort: all visits to the ED from 2/16/15-7/31/17
- Primary mortality outcome: 30-day mortality among all ED patients before and after EC3
- Primary ICU outcome: ICU admission rate before and after EC3

Results

- Patients: 349,310 encounters during period
    - Pre-EC3 cohort: 168,877 patients
    - Post-EC3 cohort: 180,433 patients
- Mean daily census of EC3 was 6.9 patients treated by EC3 clinicians and 4.1 patients as overflow from the main ED treated by the main ED clinicians.
- Mean time in ED until transfer to EC3 was 3.7 hours and the mean EC3 LOS was 9.4 hours
- Mortality
    - 30-day mortality rate among all ED patients: no difference
    - Multivariate analysis demonstrated transition to EC3 was associated with a 15.4% reduction in the odds of 30-day mortality.
    - Restricting to only patients with ESI 1 or 2, EC3 was associated with a significant reduction in odds of 30-day mortality
    - Observed reduction in risk-adjusted 30-day mortality for 73,451 patients per year in their ED equates to 220 lives saved per year after implementation of EC3
- ICU Admissions
    - Unadjusted rate of ED admissions to ICU per 100,000 ED visits decreased with implementation of EC3 by 12.9%.
    - Post-EC3 cohort was associated with a significant reduction in the odds of short-stay ICU admissions (LOS < 24 hrs)

Authors Discussion

- Mortality Reduction
    - Variables associated with improved survival are multifactorial and requires more analysis.
    - Authors point to the approximate 2 hr reduction in median time to ICU level care and 19.3% absolute increased proportion of ED patients that received ICU level care within 6 hours of presentation
- ICU Resource Optimization
    - Authors point out that many patients that would have traditionally been admitted to the ICU were stabilized and admitted to non-ICU levels of care
    - The observed reduction of 12.9% reduction in ICU admission rate is also multifactorial.
    - Authors point to the association of EC3 with short-stay ICU admissions.
    - By avoiding short-stay ICU admissions, the inpatient ICU can optimize bed resource allocation to those decompensating on the floors or interhospital transfers.

Limitations

- Single-center, uncontrolled before-and-after study design for a heterogeneous population
- Many have been other variables that were unaccounted for that contributed to the observed results. No currently accepted standard for risk adjustment of patients who are critically ill within the ED.
- Increased number of clinicians in EC3 providing care may have simply produced the mortality results.

Authors Conclusion

- Implementation of an ED-based ICU was associated with decreased mortality and decreased inpatient ICU admissions among ED patients