ARTICLE: Identifying Infected EM Patients Admitted to Ward at Risk of Clinical Deterioration and ICU Transfer

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PURPOSE:
Research Question(s): Are there independent predictors of early ICU transfer (within 48 hrs) for those patients with clinically suspected infection?

Hypothesis: none

DESIGN:
Study Design: Secondary analysis of data from 2 prospective observational cohort studies

Dependent / outcome Variable(s): None

Independent / research Variable: None

SETTING / SUBJECTS:
Research Setting: Urban Tertiary Care University Emergency Department with roughly 50,000 visits per year

Subjects:
Study population: Urban ED patients from 2 prospective observational studies conducted from 2/1/00 - 2/1/01 and 12/10/03 – 9/30/04

Inclusion / Exclusion criteria: Age greater than or equal to 18, clinical suspicion of infection as deemed by examining physician, not a direct admit to the ICU, not transferred to ICU for reasons aside from clinical deterioration.
Number (control / intervention groups): Total 5749 Patients, 335 were direct admits to the ICU and excluded. Thus 5365 in patient cohort, and 49 patients transferred to ICU within 48 hrs

Demographics: Not specified, refer to prior studies for pt demographics

Attrition: This is a retrospective review of patient charts, thus there was no attrition

METHODS:

Interventions: No interventions were performed as this is a retrospective observational study.

Study Groups: Total of 5365 patients admitted to the hospital with suspicion of infection as defined by ordering blood cultures or as stated in the medical decision making portion of the clinician’s dictation. Those patients not requiring transfer to the ICU within 48hrs were considered nonevent, totaling 5272. Those patients transferred to the ICU within 48 hrs (event) for clinical deterioration were counted and totaled 93 or 1.7%. A third group that was excluded from analysis were those patients transferred to the ICU for reasons other than clinical deterioration.

Instruments: None

Data Collection: Patients were prospectively identified in the ED with suspected infection. The electronic medical records were analysed by trained research assistants to gather demographic, past medical history, physical exam, and lab results. Researchers then retrospectively determined which patients met the primary outcome of transfer to the ICU within 48 hrs, subsequently reviewing the medical charts to determine the reason for transfer. A secondary endpoint of in-hospital mortality was also recorded.

DATA ANALYSIS:

Level of Data: Categorical Ordinal Interval

Statistics Used: Univariate analysis for possible predictors of the primary outcome, using a relaxed p value of <0.2 to identify those predictors for a multivariate model. Multivariate logistic regression was then employed to select independent predictors of early ICU transfer. Using forward selection, allowing a variable to remain in the model when p < 0.05, researchers built a multivariate model and provide odds ratios, corresponding 95% confidence intervals and p-
values for each variable. Finally, an area under the receiver operating curve was reported to describe the overall discrimination of the model.

- *What, if any, confounding variables were controlled for / adjusted for:* none

**RESULTS:**

- *Brief answers to research questions:* Patients with transfer to the ICU within 48hrs were generally older, had increasing number of comorbidities, decreased blood pressure, tachypnea and evidence of respiratory compromise. Seven independent predictors were identified:
  1) Respiratory compromise (resp rate > 20 breaths / min or O2 sat < 90% while in ED) – Adjusted OR 2.5, CI 1.4-4.3, p 0.002
  2) Congestive heart failure – Adjusted OR 2.2, CI 1.4-3.6, p 0.001
  3) Peripheral vascular disease – Adj OR 2.0, CI 1.1-3.7, p 0.02
  4) Moderate hypotension (minimum SBP < 100 while in ED) – Adj OR 1.9, CI 1.2-2.9, p 0.007
  5) Tachycardia (HR > 90 bpm in ED) – Adj OR 1.8, CI 1.1-2.8, p 0.02
  6) Elevated Creatinine – Adj OR 1.8, CI 1.1.2.8, p 0.02
  7) Cellulitis – Adj OR 0.33, CI 0.15-0.72, p 0.01

- *Additional findings:* No difference in mortality between those admitted directly to the ICU from the ED (19%) versus those transferred to the ICU within 48hrs (24%), p-value of 0.3. Subjects on the hospital floor had significantly lower mortality of 4% compared to either ICU group, with p-values <0.001 for both.

- *Other possible explanation for findings:* none

- *Limitations?:* Biggest limitation for this study is the low numbers of events, ie transfer to the ICU, at 93 or 1.7%. This limits the power of the study. This is an exploratory study, with no independent study sample upon which to validate the findings. It is a retrospective, observation study, and a good “first step” to identifying possible predictors of early decompensation and need for ICU level care.

**IMPLICATIONS FOR PRACTICE:**

- *Applicable to this clinical practice:* This study addresses an important question for the Emergency Medicine practitioner, and it is a question that has not been
previously addressed. It warrants further investigation with a prospective analysis of ED patients, using control groups, and potentially broadening the patient population to include undifferentiated patients to increase the power of the study.

- Clinically Relevant: Results were certainly relevant to clinical practice, but not ready for implementation. This was a preliminary study, and much will be needed to translate into clinical practice. There will need to be validated and reproducible findings to warrant the admission to ICU level care simply based on risk factors seen in the ED.

LEVEL OF EVIDENCE / DECISION FOR USE:

- Background  Consider Replication

- Level of Evidence: III
  Ia  Evidence obtained from meta-analysis of randomized controlled trials
  Ib  Evidence obtained from at least one RCT
  IIa Evidence obtained from at least one well-designed controlled study without randomization
  IIb Evidence obtained from at least one other type of well-designed quasi-experimental study
  III Well-designed non-experimental studies
  IV  Expert committee reports, opinions of experts