Critical Review Form
Therapy

Adding More Beds to the Emergency Department or Reducing Admitted Patient Boarding Times: Which Has a More Significant Influence on Emergency Department Congestion? *Annals EM* 2009 (in press)

Objectives: **"To develop and deploy a computer simulation model to evaluate potential bottlenecks and solutions in an ED" and "to analyze the effect of these findings through sensitivity analyses of model inputs". (p. 2)**

Methods: **Using a pre-existing one-month data set from the Northwestern University ED, investigators used a computer simulation to evaluate two operational strategies to combat ED overcrowding and length of stay: increasing the number of ED beds versus increasing the rate at which admitted patients leaves the ED for inpatient beds.**

In developing their model, investigators made multiple assumptions including: no urgent care patients admitted; lowest ESI patients always prioritized; 70% of arrivals between noon and midnight; testing only obtained after physician evaluation; admission rates by ESI constant (1 = 55%, 2 = 57%, 3 = 31%, 4 = 5 = 1%) and all admitted patients wait in hallway for inpatient bed.

The primary outcome was ED length of stay (LOS) defined as time between sign-in and ED departure. Using these assumptions, 4-scenarios were run:

1) **ED with 23 beds and 1-admitted patient leaving the ED every 20 minutes.**
2) **ED with 28 beds and 1-admitted patient leaving the ED every20 minutes.**
3) **ED with 23 beds and 1-admitted patient leaving the ED every 15 minutes.**
4) **ED with 28 beds and 1-admitted patient leaving the ED every 15 minutes.**

To test their assumptions, investigators conducted a sensitivity analysis varying ED beds, admitted departure rates, daily ED census, proportion of ESI that were 3 or 4 or 5, ESI 2 or 3 treatment times and admission rates, and ESI 3 or 4 or 5 left without being seen rates.

Guide		Comments
I.	**Are the results valid?**	
A.	**Did experimental and control groups begin the study with a similar prognosis (answer the questions posed below)?**	
1.	Were patients randomized?	No randomization. No true experimental and control; however, authors did compare model data to actual data from two different months.
2.	Was randomization concealed (blinded)?	No randomization. No actual patients.
3.	Were patients analyzed in the groups to which they were randomized?	No actual patients to analyze.
4.	Were patients in the treatment and control groups similar with respect to known prognostic factors?	No actual patients but the model data was fairly close to actual results (12% under-estimated LOS, Table 3, p.6)
B.	**Did experimental and control groups retain a similar prognosis after the study started (answer the questions posed below)?**	
1.	Were patients aware of group allocation?	No actual patients.
2.	Were clinicians aware of group allocation?	No real-time treating clinicians.
3.	Were outcome assessors aware of group allocation?	Patients not truly allocated to any group, so nothing to which outcome assessors could be blinded.
4.	Was follow-up complete?	N/A
II.	**What are the results (answer the questions posed below)?**	

1.	How large was the treatment effect?	• When increasing ED from 23 to 28 beds but keeping admitted departure rates at 1-patient every 20 minutes, the ED mean LOS increased from 240 minutes to 247 minutes (95%, CI 0.8-13 minutes) • When increasing admitted departure rates from 1-patient every 20 minutes to every 15 minutes in 23 beds, the mean LOS decreased from 240 minutes to 218 minutes (95%, CI -26 minutes to -17 minutes). • In sensitivity analysis ED bed size never decreased LOS, but admitted departure times always did so even when varying assumptions noted above. • Threshold LWBS times did not significantly impact LOS for ESI 3, 4, or 5 patients.
2.	How precise was the estimate of the treatment effect?	See CI above. For decreased departure rates CI do not cross zero.
III.	**How can I apply the results to patient care (answer the questions posed below)?**	
1.	Were the study patients similar to my patient?	Yes, similar urban academic center with identical volume and near-identical ED layout and staffing.
2.	Were all clinically important outcomes considered?	No patient important outcomes were measured or presented. Future research should assess outcomes, such as disease-related mortality and morbidity, patient satisfaction, test ordering and diagnostic/therapeutic error for both ED and inpatient patients resulting from increased ED size or decreased admitted departure rates.
3.	Are the likely treatment benefits worth the potential harm and costs?	Potential harms not studied or addressed. Increasing ED outflow times will decrease the patient-important outcome of ED LOS and be financially beneficial to EM.

Limitations

1) **Model based analysis completely dependent upon baseline assumptions, though results robust to sensitivity analysis.**
2) **Multiple confounders not measured or modeled such as staffing levels with increased ED size, procedural-intense patients, and consultant delays.**

Bottom Line

Robust computer model from single ED suggests that ED LOS can be reduced by decreasing admitted patient departure times, but not by increasing the number of ED beds. Future research should prospectively confirm this finding while controlling for myriad confounding variables (staffing level, patient acuity, consultant responsiveness, etc.) before widespread acceptance of these findings occurs.