Boarding in your Emergency Department is Hurting your Hospital Financially and Making your Patients Less Safe

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Forcing your ED to be *'a hospital within the hospital'* weakens operational efficiency, financial viability and care quality.

By Dan Dellaferrera

It is a decades-old truism among seasoned clinicians that crowded hospitals don't run well, waste resources, accelerate staff burnout and weaken patient safety. Throughout my career in healthcare research, I haven't come across a single CMO, CNO, ED Director or Patient Flow Coordinator who disagreed with that sentiment, regardless of whether the conversation took place in Chicago, Melbourne, or anywhere in between.

What is, unfortunately, far less common than the consensus referenced above is a thorough root-cause analysis about the origins of unsustainably high occupancy rates. Even within a single acute care site, people who share a mission and cooperate effectively across multiple goals disagree on what's hindering effective patient flow and on how to fix those issues, e.g:

- Floor bed managers will complain about ED staff and surgeons behaving ***"as if they owned the beds***" and pressuring them to rush patients out.

- Surgical staff will reference the number of cancelled or postponed surgeries when post-op beds are not available.

- Physicians and nurses in the ED will tell you how many patients they are boarding and how this forces them to run ***"a hospital within the hospital."***

The challenges that arise from healthcare demand that exceeds capacity are complex enough for all of those opinions to be (partially) right, while none tells the whole story. Rather than take sides, I believe that mature data analytics can enable solutions that satisfy the needs of the ED, the OR, the *'Bed Czar'* and the organization as a whole.

Applied data analytics that can help actionable decisions regarding the most effective use of scarce resources is doubly important now, since I haven't come across any health systems (publicly or privately funded, in Toronto, Manchester or Los Angeles) able to cope with increasing demand by building additional physical capacity. Significant capital expenditures on extra beds are not on the near-term horizon for anyone.

If the realistic solution arises from analytics-enabled efficient use of the capacity we have now, the next step is to estimate the return on our investment in analytical capabilities. Ex-ante costs are helpful when doing that. A recently published **study** indicates that the **cost of boarding patients in the ED is roughly twice as high as the cost of caring for them in inpatient beds**. The same study revealed that **ED boarding is even more expensive than using ICU beds, increasing daily cost by 5 to 17 percent**. Anecdotal evidence collected by the researchers involved in the study indicates that boarded patients receive less (and probably lesser) care in the ED, in spite of the higher cost incurred.

On the other hand, cautious optimism arises from the experience of a hospital where the use of machine learning results in faster and higher-quality decisions that decrease boarding time overall; and solves the ambiguity that plagues mid-acuity patients in the ED.

This hospital reports that roughly **25 percent of its admission volume originates in their ED, but also acknowledges that 75 percent of that volume is highly unpredictable in terms of its composition**. This will resonate loudly with anyone who has treated mid-acuity ED patients (i.e. Triage categories 3 and 4 in numerical scales, "Yellow" patients in most chromatic scales). Their **ex-ante situation resulted in an average ED Length of Stay of 6 hours and 20 minutes** (4 hours and 30 minutes between check-in and the decision to admit; plus an additional hour and 50 minutes until the actual bed assignment). Since mid-acuity patients tend to be a heterogeneous group that represent almost two thirds of ED-originated admissions, it became crucial to answer two operational questions:

- **Which of these patients need to be admitted to inpatient beds?**

- **How do we build a decision support model that yields the best possible care for patients while lessening the burden on busy ED teams?**

The hospital used machine learning to create a prescriptive analytics tool that reduces ambiguity and variation around the decision of whether to

admit an ED patient. The tool uses the patient's history and symptoms, triage score (ESI) and vital signs to generate a propensity score that outlines the statistical likelihood of admission. Most importantly, **the propensity score alone does not automatically mandate admission, but rather informs the decision to admit made jointly by an ED clinician and a patient flow manager** (Feel free to insert a *'Skynet v. Sarah Connor'* joke here). It's worthwhile noting that each patient's propensity score changes during their time in the ED, increasing or decreasing as test results and other information become available.

This solution decreased ED ALOS by 4 hours (from the 6h20' referenced above to 2h20' from check-in to bed assignment), allowing for **up to a 63 percent reduction in ED boarding time**. Retrospective analysis of actual admissions determined by the clinical team showed that **the propensity score generated by the model accurately predicted admission 94 percent of the time**. Clinical quality and patient safety metrics (both for the ED and for admitted patients) improved after the implementation of the solution, but that deserves its own separate article.

Frontline clinicians in the ED also appreciated the clarity of decision-making about patients who did not need to be admitted and could be sent home directly from the ED. Their low propensity scores confirmed that was the right course of action, gave ED doctors and nurses additional confidence that patient safety was not hindered, and further decreased ED overcrowding.

This hospital's experience shows that understanding data is essential to improving ED performance and overall patient throughput. Analytics-supported decision-making is not only faster and less burdensome on frontline clinical teams. It is also clinically, operationally and financially superior (while resulting in safer care and higher patient satisfaction). Contrasting this experience against the figures cited at the beginning of this piece show how actionable data analytics are a better candidate than brick and mortar when investing in solutions to healthcare's capacity shortage.