

# ED Flow Prediction

IMPROVING OPERATIONAL EFFICIENCY  
THROUGH BETTER CARE, OPTIMIZED STAFFING  
& FUTURE INSIGHTS



People seek ED care for emergent, urgent, and routine care needs. Emergency Department (ED) visits are frequent with 43 visits a year for every 100 people and a common entry point to the healthcare system, with as many as 80% of inpatient admissions occurring through the ED. An aging population means more people are seeking care in the ED, resulting in increased crowding and longer waiting times. ED overcrowding, which occurs when demand for services overwhelms the ability of the ED to provide care, is recognized as a national problem that hinders care delivery. Crowded EDs fall short in all aspects of the quadruple aim, with poor patient satisfaction, worse clinical outcomes, lower provider satisfaction and increased spending. ED crowding leads to increased wait times, which is directly correlated to patients leaving the ED without being seen (LWBS). Recent estimations show each LWBS patient costs a health system \$500 per patient, or several million dollars per year in lost revenue. Crowding also leads to a higher number of boarding patients, longer inpatient LOS, and increases cost for a typical hospital by \$3-5m annually.<sup>[1]</sup>

## The Value of Machine Learning in ED Flow

The KenSci ED Flow Solution aims to provide predictive insights to allow EDs to better anticipate and plan for fluctuations in ED care needs. The comprehensive solution includes predicting ED arrivals, the mode of arrival (i.e. with EMS), and the acuity of the patients. It identifies patients at risk for LWBS, predicts ED census, load (i.e. NEDOCs), and likely waiting times. Additionally, the ED Flow Solution predicts the disposition of patients out of the ED (admission vs discharge). This end-to-end solution permits ED care to be optimized via staffing optimization, allows providers to prioritize at-risk patients, and streamline workflow and inpatient admissions.

## Operationalizing Machine Learning in ED Flow

Applying the KenSci ML Solution leading to ED throughput has the potential to minimize patient care delays, improve the overall quality of care, and promote consistent and cost-effective staffing models. While the solution provides comprehensive ROI for health systems, one of the most straightforward paths to ROI is associated with reducing LWBS rates in ED patient flow. With the ED Patient Flow solution, health systems will see a reduction in LWBS rates, leading to increased revenue from more ED visits and additional ED to IP admissions.

While variation is inherent in healthcare, unwarranted variation can be addressed and diminished. By leveraging publicly available data, the ED Flow solution can identify significant variation across process measures like "door to doctor" time and performance metrics including "left without being seen" rates throughout

KenSci can provide LWBS reduction (for a typical 50,000 visit/year ED):

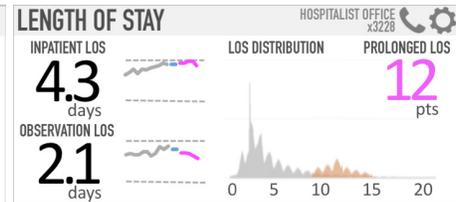
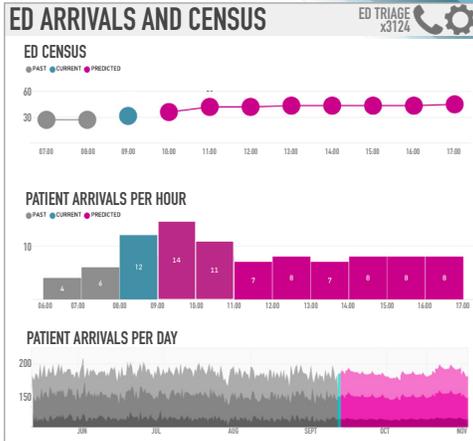
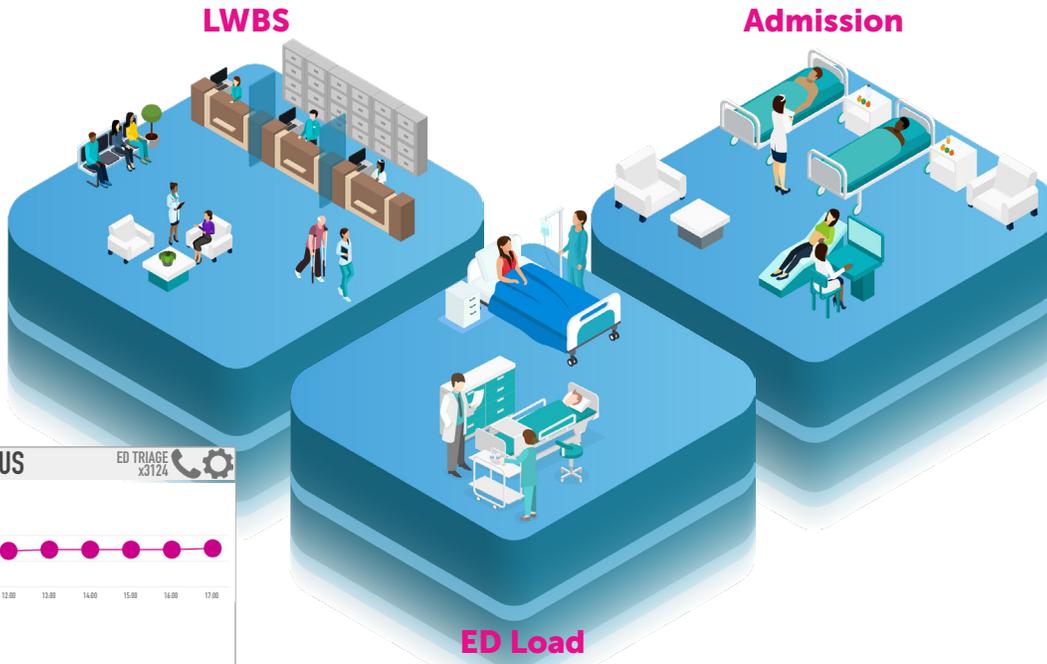
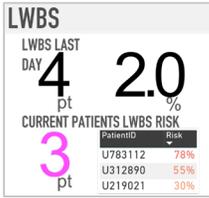
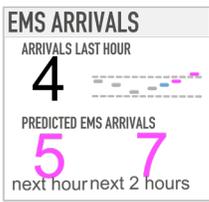
Reduction in LWBS from 4% to 2% equating to **\$365k/year** in additional ED billing.<sup>[2]</sup>

Increased hospital admissions equating to **\$292k/year** in additional hospital billing.<sup>[3]</sup>

KenSci can provide staffing optimization:

Reduction in staff OT by 50%<sup>[4]</sup> resulting in approximately \$5,000 in savings per employee or about \$130k/yr in decreased labor costs.

Improved satisfaction leads to reduced staffing turnover.



multiple EDs. Such variation provides the opportunity to examine facility-specific performances and identify processes to aid predictions. Realizing and describing this variation across facilities will allow KenSci ML models to help you identify the highest ROI opportunities in process improvement. More accurate predictions of these ED processes will then allow surfacing of operational insights that can be modified to assist with ED and hospital flow.

ED load optimization and improved patient throughput leads to decreased inpatient LoS.

Obtaining actionable data from ED patient flows is challenging, requiring near real-time data integration from multiple systems to support comparisons across departments and workflows. In order to put this solution into practice at your health system, certain data elements are required. This solution requires electronic medical record (EMR) data from emergency department encounters - including date/time stamps for processes such as patient registration, patient triage, and other points in the process of ED care. Inpatient care data is beneficial for the model's training. Further information on data requirements are available upon request.

[1] Sun BC, Hsia RY, Weiss RE, Zingmond D, Liang LJ, Han W, McCreath H, Asch SM. Effect of emergency department crowding on outcomes of admitted patients. *Annals of emergency medicine*. 2013 Jun 1;61(6):605-11.  
 [2] 100 visits/day x \$500/visit = \$365,000  
 [3] 20% of patients admitted x 730 patients/yr = 73 additional admissions/year x \$2000 avg charge/admit = \$292k/yr



KenSci's risk prediction platform identifies population health risks, optimizes clinical outcomes and operationalizes efficiency across the care continuum, making healthcare more proactive, coordinated and accountable - fast.

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