The Shift to Proactive: Choosing the Right Tool for Anticipating Patient Admission

How AI-powered disposition models are transforming emergency department throughput and why accuracy is everything.

Prepared by
Choreo-ED Clinical Team

Topic
ED Patient Flow Optimization

Key comparison
Choreo-ED vs. Epic ED Predictive Model

Anticipating patient admission and discharge early is crucial in optimizing hospital operations. Today, hospitals face significant wait times, resulting in overcrowding and lower patient satisfaction ratings while compromising quality of care. Though a whole system approach is necessary — studies point to challenges with staffing, resource allocation and boarding — integrated tools and real-time analytics can help your team move patients through the ED more efficiently.

We see various technical tools entering today's market, all designed to equip physicians and care teams with patient information they need to anticipate admissions, improving patient flow down the line. However, the impact of these models relies significantly on quality and accuracy. In this piece, we'll break down different measures for a strong, reliable model that can position your team for success.

Efforts to Reduce Wait Times

Emergency departments today may focus on boarding and triage protocols, or implement fast-track systems for low acuity patients to reduce crowding in the ED. This may look like creating swim lanes or leveraging local heuristics, like provider in triage (PIT) programs. While some of these tactics are widely accessible and perform favorably, studies reveal they may not always result in significant time savings downstream. For example, in a pre-post study gathering data at a Level I trauma center, physician triage decreased length of stay (LOS) for discharged patients and left without being seen (LWBS) rates. However, LOS for admitted patients stayed the same and boarding times increased during the intervention period. These approaches may be subject to inconsistencies, considering variations in clinician experience, subjective judgement and a lack of standardization across teams and shifts.

Alternative Approaches to Patient Disposition

As an alternative or complementary tool, anticipated patient disposition models are on the rise. These AI models are designed to help care teams make admission, discharge or triage decisions with critical, real-time data at their fingertips. While some function as clinical decision support tools — offering insight to make clinical and diagnostic decisions — others entirely exist to provide information for care teams.

The team at Choreo-ED created a deep learning model to anticipate admission decisions, built on patient data from individual hospitals. In real time, Choreo-ED creates a holistic view of a patient — gathering historic patient data

as well as vitals, labs and encounter data — then notifies care teams at points in the workflow when information is most needed.

Epic created a similar tool to improve bed planning and operational processes. Once a patient enters the ED, the model gathers data from the Epic EHR and various sources to score the patient's likelihood of admission every 15 minutes. In practice, care teams access this information to help inform next steps and assignments in the patient flow.

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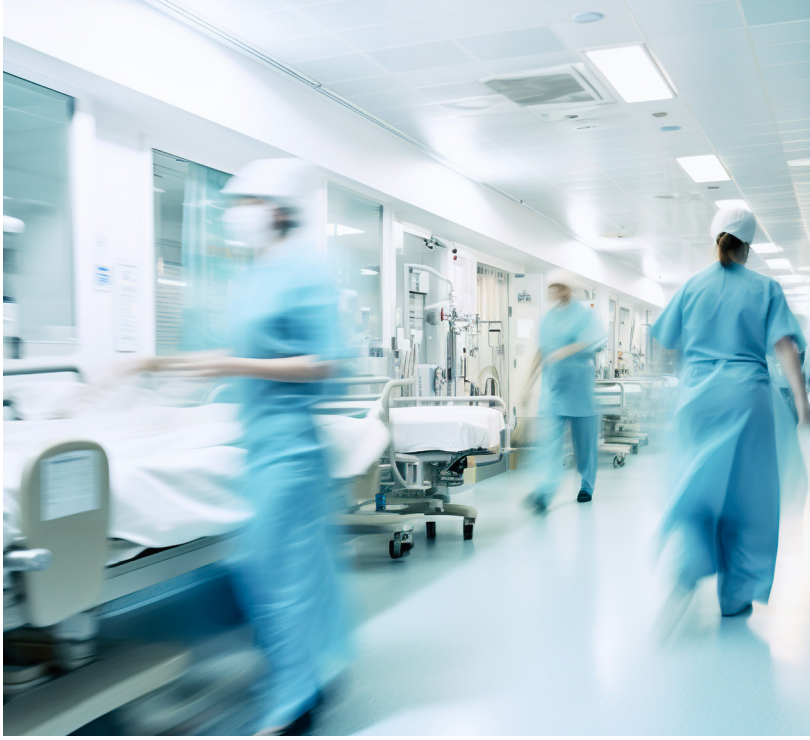
Choosing the Right Tool

While innovative in nature, Epic's ED Likelihood to Occupy an Inpatient Bed (ED Predictive Model) tool has drawbacks that could significantly reduce its impact. In an industry critique of the model, one physician labeled the tool a "technological solution looking for a problem." To be useful in the patient flow, these tools must be highly accurate. While the Epic ED Predictive Model tool showed good overall performance, with an AUROC of 0.849, its precision was fairly low , at 0.643, indicating a higher number of false positives which limits the teams from acting confidently on the alerts. Provider-behavior bias is another important assessment for accuracy. The Epic ED Predictive Model tool may be more subject to provider-behavior bias, as it pulls data primarily from its own EHR.

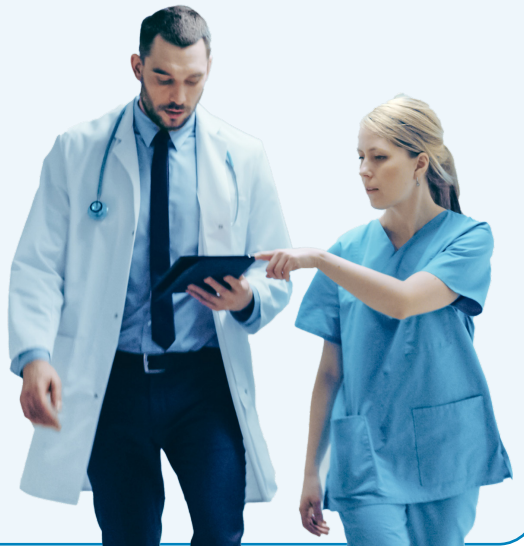


In addition, care teams may not have 15 minutes to know if a patient needs to be admitted, but rather they need accurate information to free up capacity for necessary tasks. Time is of the essence, and while Epic's ED Predictive Model tool may assist downstream tasks, it doesn't assist in early intervention.

The Choreo-ED Difference

Choreo-ED was developed in collaboration with care teams to address specific challenges in the patient flow. Refined over multiple iterations, including review cycles with ED physicians, nurses and throughput coordinators to assess bias and improve accuracy, Choreo-ED performs more efficiently than its competitors. The solution integrates directly into EHRs — like Epic — to anticipate admission decisions with more accuracy..

Proactive, Not Reactive. While Epic's ED predictive model is a one-size-fits-all model, Choreo-ED is uniquely trained and validated on each hospital's data to improve overall accuracy and align with each hospital's ED patient flow. he Choreo-ED solution updates its anticipated decision to admit (ADTA) score as each new data update arrives in real time as opposed to operating on fixed update intervals, and while Epic's ED predictive model is limited as a random forest model, Choreo-ED leverages a more powerful and flexible deep neural network architecture, resulting in its better performance



The clear difference between Choreo-ED and the Epic product is the highly precise, early anticipation of the patient requiring admission or discharge. EPIC decision tools lag considerably behind Choreo.

— Ronnie Best, Emergency Medicine Physician, Berkeley Medical Center

HEAD-TO-HEAD PERFORMANCE

Higher Accuracy, More Reliability.

In nearly all categories, Choreo-ED outperforms Epic's ED predictive model. Most notably, Choreo-ED's Positive Predictive Value (PPV) is 0.9. While over 1/3rd of Epic's predictions were false positives, only 1/10th of Choreo-ED's were false positives. In general, Choreo-ED's anticipated patient dispositions are more aligned with front line clinical intuition, more consistent and less susceptible to human bias.

Epic ED Predictive Model

One-size-fits-all random forest model

0.849	AUROC	Good overall discrimination
0.63	AUPRC	Lower precision-recall balance
0.65	POSITIVE PREDICTIVE VALUE	1 in 3 predictions false positive
0.49	SENSITIVITY	Misses nearly half of cases
127m	LEAD TIME	Updates every 15 minutes

Choreo-ED ADTA

Outperforms in all categories

0.93	AUROC	+9.5% better discrimination
0.84	AUPRC	+33% improvement
0.90	POSITIVE PREDICTIVE VALUE	Only 1 in 10 false positive
0.53	SENSITIVITY	Captures more true positives
129m	LEAD TIME	Real-time continuous updates

Epic ED predictive model performance metrics sourced from: Prospective External Validation of a Commercial Model Predicting the Likelihood of Inpatient Admission From the Emergency Department. Annals of Emergency Medicine, 2023. Link

Smarter Alert Timing, Broader Impact.

To ensure Choreo-ED's signals reach care teams at the right moments, we identified three key milestones in the ED encounter that provide the best opportunities to surface the model's anticipated disposition.

Combined, Choreo-ED enables care teams to confidently act early on 61% of patients who walk through the door. With timing validated and workflows proven safe and effective, these alerts are integrated directly into existing ED trackboards — fitting into the way care teams already work.

At Triage: 01

The anticipated disposition model can aid in the routing of patients to fast track.

After first point of contact with a physician: 02

When initial orders have been placed by the ED there is a strong internal activation point within the ED. At this time, prioritizing lab results and radiology studies can improve patient throughput by accelerating the workup.

When the First Labs Result: 03

Approximately 30 minutes later, rapid tests are available (CBC, CMP, and high-sensitivity Troponin). Those initial reads can give admitting hospitalists enough information to begin working with the ED on the admission.

Learn More About

choreo ED™

Offering both admission and discharge models, Choreo-ED fits seamlessly into clinical workflows, operating as an addition to your care team.

Our team is currently filling roles in the Choreo-ED pilot program. To learn more about the application or apply; Contact Us