The impact of the patient population on ED operations: Patient Complexity and Throughput

James Scheulen & Heather Blonsky AAAEM Benchmark Committee Vizient, Inc



Benchmarking in Emergency Medicine Building a Cohort

> "Our patients are sicker..." "Our patients are different..." "Our patients need more..."











Benchmark Committee: 20 EM Administrators and Physician Leaders





Benchmarking in EM







Academic Departments of Emergency Medicine

- Academic Medical Center focus
 - Clinical Care, Research, Education
- Community Hospitals as part of Health Systems
- Benchmarking ED and Faculty Performance



Benchmarking in EM

Comparing the activity or operations of one emergency department with others for the purpose of quality or process improvement

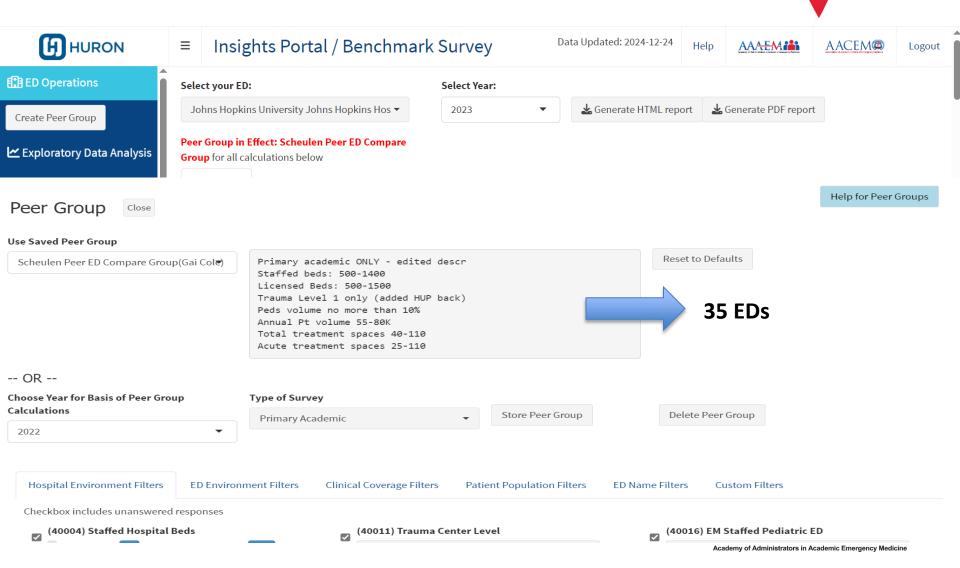
DEMOGRAPHICS													
	Institution	Peds ED	Staff Peds	Provider	Provider Triage		Boarding Pts: Who Provides	Boarding ICU Pts: Who Provides	Boarding Pts: Hosp provides Nursing	Boarding Pts: Hosp provides financial	Trauma	Charting	Licensed Hospital
Region	Туре	Separate	ED	in Triage	Hours/ Day	Fast Track?	Care	Care	support	support?	Center Level	Assistance Used	Beds
Midwest					0		Inpatient	Inpatient			I.	Scribes	105
18	Private	Yes	Yes	Yes	0	Yes	58	39	Yes	Yes	62	5	479
Northeast	49	44%	40%	54%	9	78%	ED	ED	41%	24%	П	Dictation	655
37					16		24	37			5	51	826
South	State	No	No	No	32	No	ED Hospitalists	ED Hospitalists	No	No	ш	Both	1,541
20	39	56%	60%	46%	9	22%	1	0	59%	76%	1	24	668
West					9								655
18	88	90	87	90	58	88	83	80	82	79	85	88	85
Northeast	Private	Yes	Yes	Attending only	17	Yes	Inpatient	ED providers	Yes	No	I	Both	656
Northeast	Private	No	No	Attending only	13	No	Inpatient	ED providers	No	No	Not Applicable	Both	247
Midwest	Private	Yes	No	No	0	Yes	ED	ED providers	Yes	No	I	Neither	1,034

AAAEM/AACEM Benchmarks

- Benchmark Presentations
 - <u>Emergency Department Operations</u>
 - Emergency Medicine Research and Education
 - Faculty and APP Staffing
 - Faculty and APP Demographics and Salary
 - Special Section/Research Reports
 - Development of Operations Based Complexity Index
 - Development of Patient Based Complexity Score



Benchmarking in EM



The Academic ED

Fiscal Year 2023	Median
Hospital Beds	604
Licensed ED Beds	57
Total Bed Hours	536,560
% Bed Hours to MAIN	69%
ED Treat & D/C	38,248
ED Admissions	14,803
Hospital Observation	2,854
Total Visits	63,591
Hospitalized Rate (Calc)	27.8%
Unique visits	66.4%

63,591 Visits Range: 28,011 – 144,710



40,878 Unique visits



Patient Volume Trend: Median

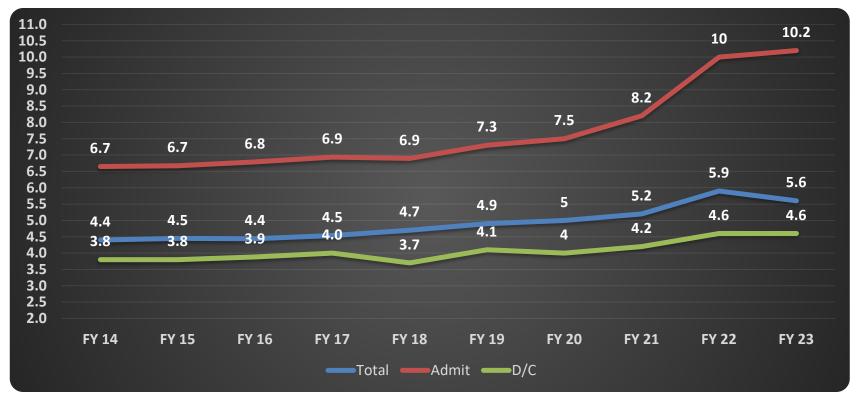
Patient Volume Trend—All Responders FY 23





LOS Trend: Median LOS

Median Emergency Department Length of Stay



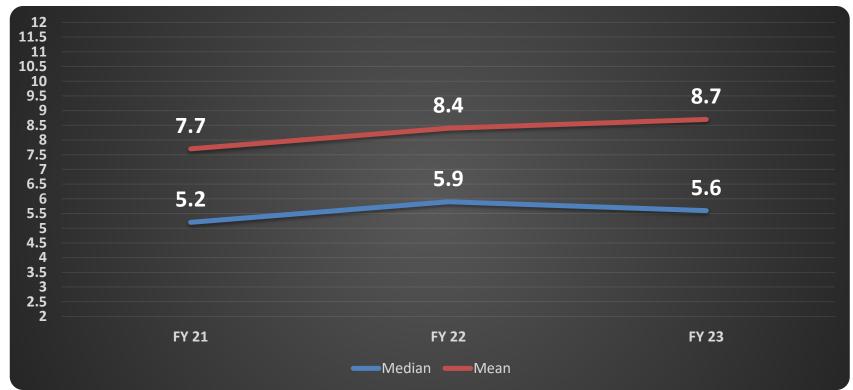
Median times represented here Mean times are longer Distribution with a long right tail



Hours

LOS Trend: Median vs Mean LOS

Total ED LOS: Mean vs Median



Mean times represent what staff and patients experience Data distribution has a long right tail



Sub-cycle Time

DISCHARGED PATIENTS

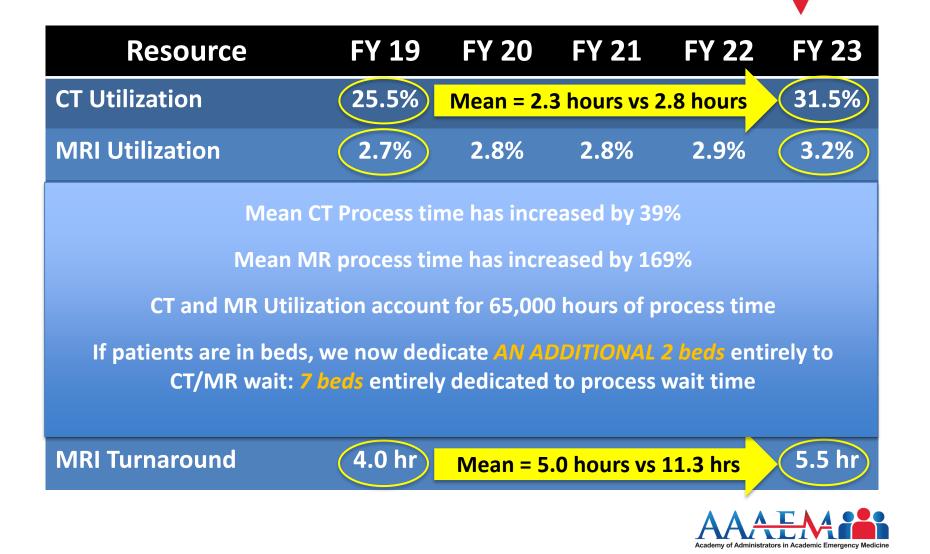
- Arrival to Provider: 1.0 hr
- Provider to Decision: 3.9 hr
- Decision to Depart: 1.0 hr

ADMITTED PATIENTS

- Arrival to Provider: 1.0 hr
- Provider to Decision: 5.5 hr
- Decision to Depart: 8.0 hr

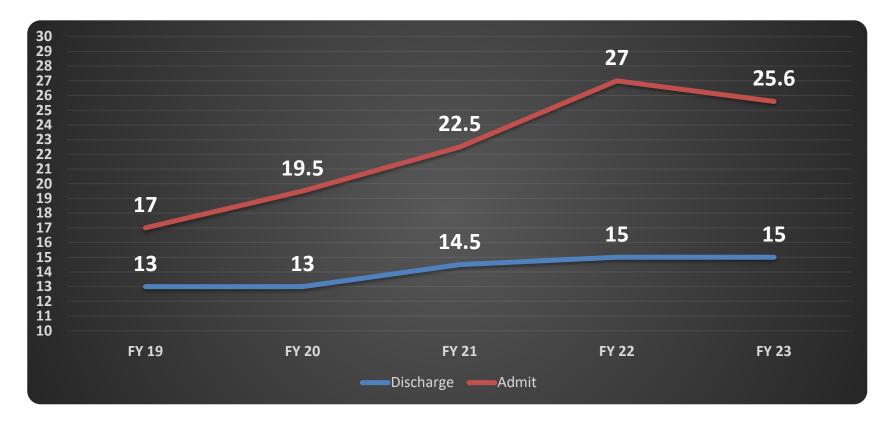


Ancillary Resource Utilization



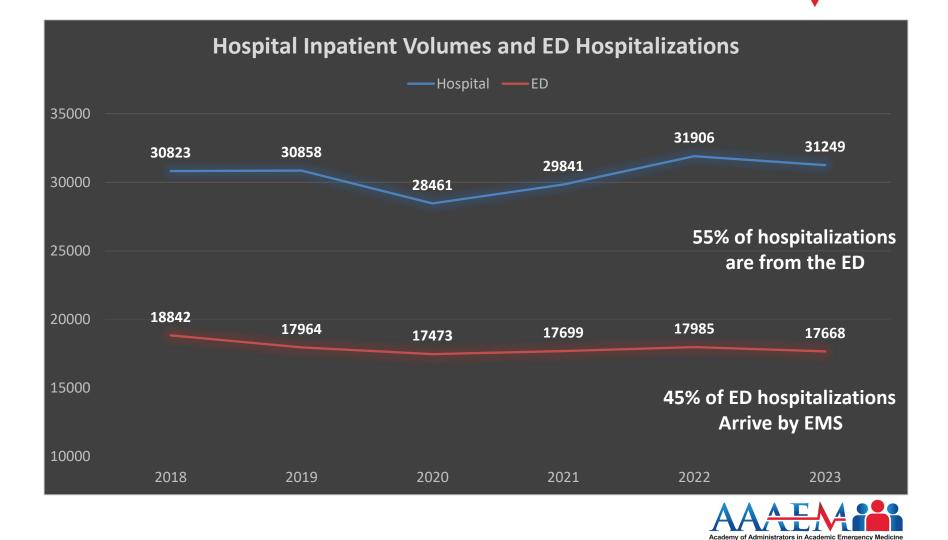
LOS Behavioral Health

Behavioral Health Patients = 5.7% of Arrivals or 3500 patients

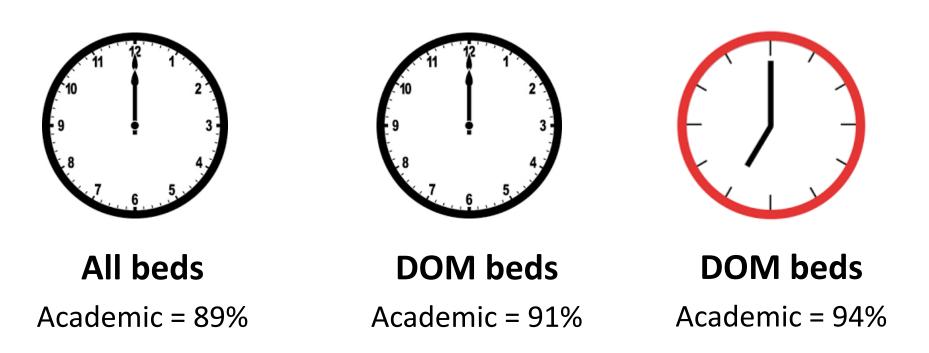




Hospitalization Data





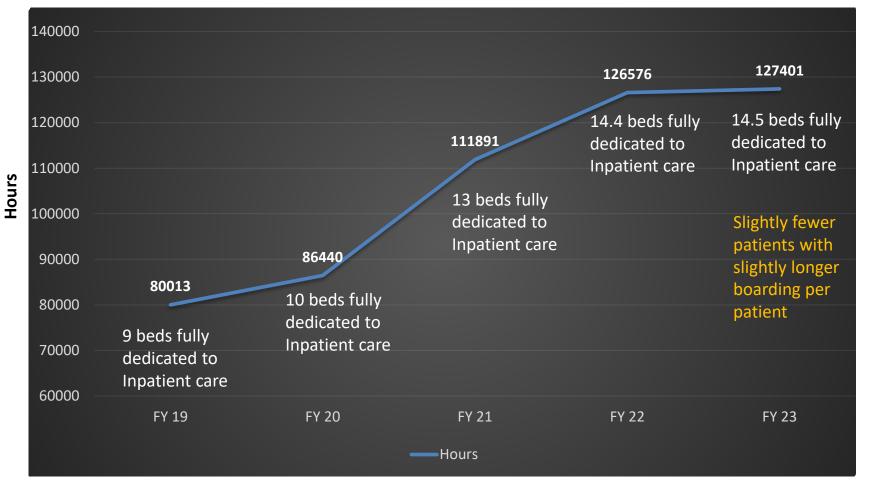


Approximately 80% of all patients in DOM come from the ED Approximately 67% of all ED hospitalizations go to DOM



Boarding Time

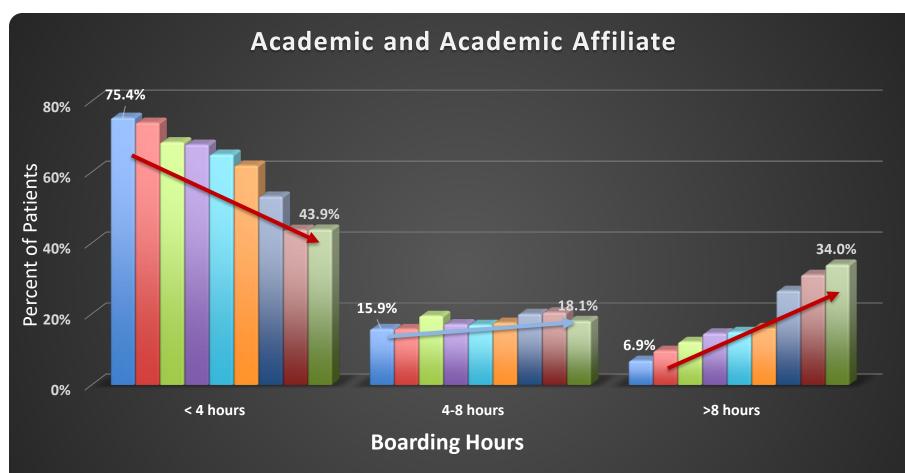
Total Boarding Hours



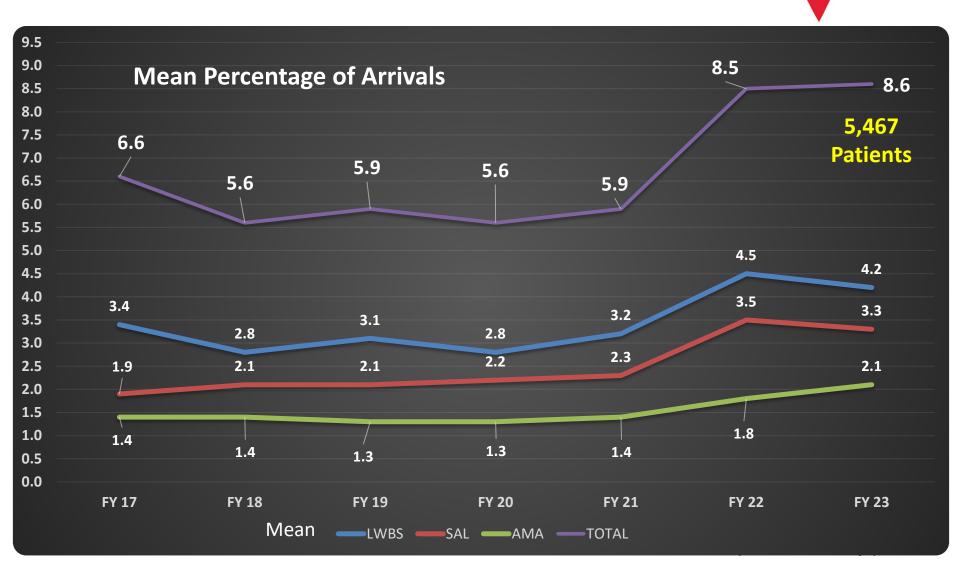


Boarding Distribution

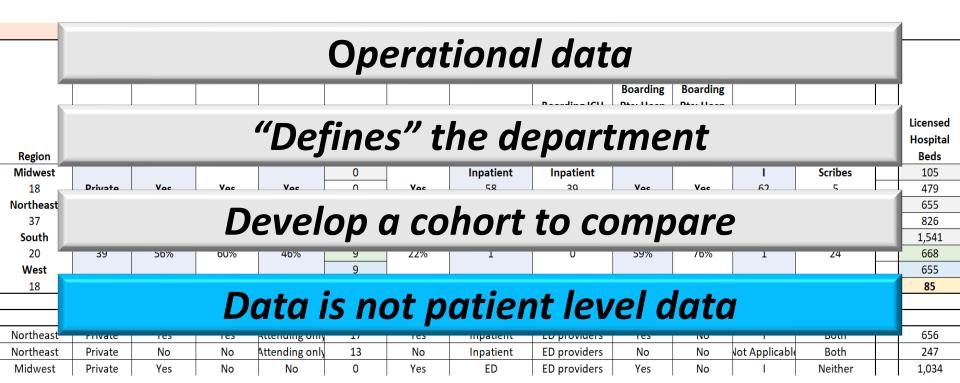
FY 2015 vs FY 2023



Left Before Treatment Complete



Comparing the activity or operations of one emergency department with others for the purpose of quality or process improvement



Defining your department

Developing the right cohort Understanding resource needs

Operational Variables

- Visit volume
- Teaching vs Community
- Hospitalization rate
- EMS arrivals

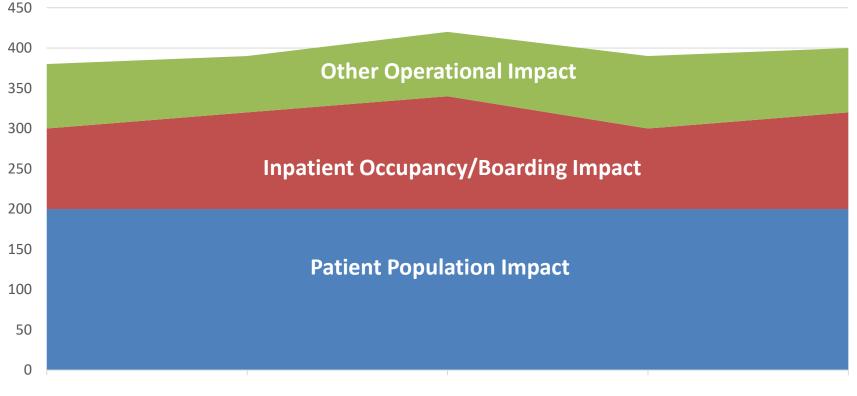
Patient Population

- Patient history
- Presenting complaint
- Co-morbidities
- Social needs



Throughput Impact Layers

Impact of Patient Population vs Operations/Boarding



■ Population ■ Boarding ■ Other



Benchmarking in EM



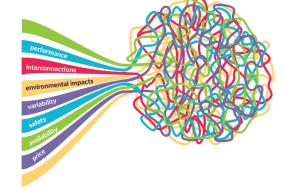
How does the composition or complexity of the patient population impact operations



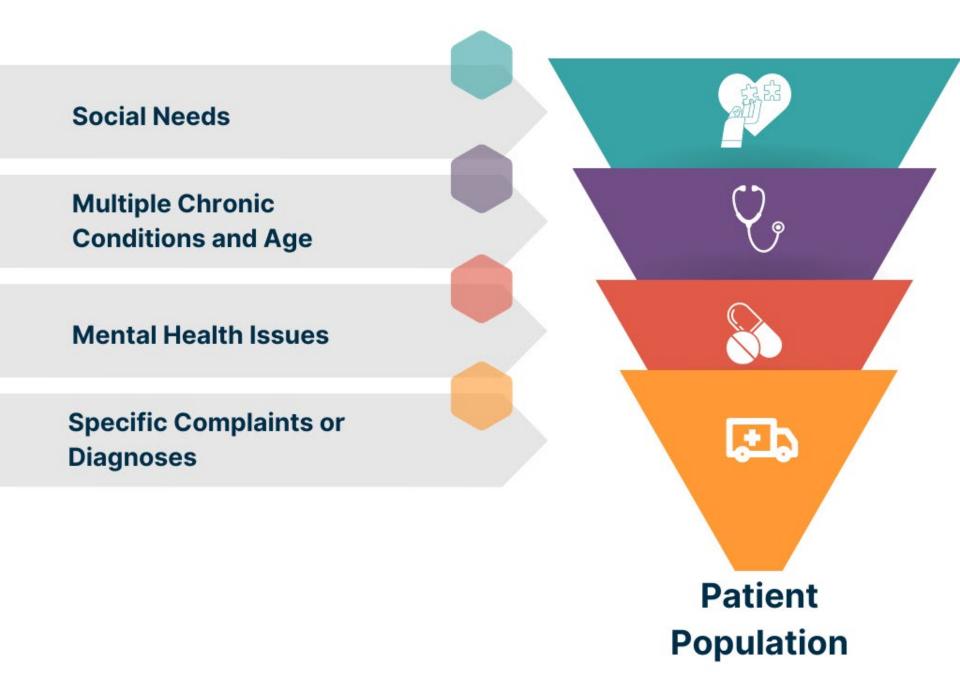
Patient Population Definition

Understanding the *composition and complexity of the patient population* in each emergency department as a way to better understand the *resources required* to care for that patient population.

- *Time* as a proxy for resource demands
- Patient level data
- On any given day, what do we face?
 - Interactions between patient variables







Our Challenge

- A way to describe a patient population
- A way to consider multiple patient based variables
- A way to compare among ourselves
- A way to compare ourselves to ourselves over time

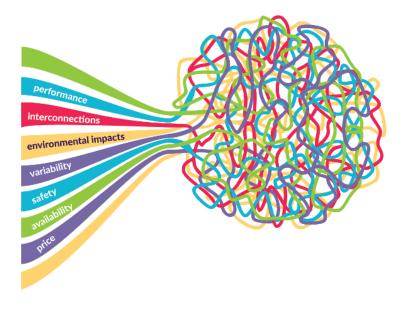


Acuity versus Complexity

<u>Acuity</u>

Severity of illness Priority setting Implies **SPEED** is required





Complexity

Multiple care needs Personal, social and clinical needs together Implies **TIME** is required



Previous Efforts

OPERATIONAL METRICS CASE MIX INDEX FOR ED ADMISSIONS COMPLEXITY INDEX DEVELOPMENT



Inpatient Case-Mix Index

Inpatient Case Mix Index: Hospitalized from ED

- Resource based index
- Indicates acuity/complexity but impacted by high cost treatments

	CMI w/o HAC
Primary Academic	1.94
ED Admissions	1.80
Non-ED	2.07
Community	1.45
ED Admissions	1.45
Non-ED	1.49

AMC > Community Hospital

AMC ED > Community ED

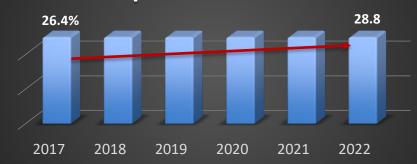
Non-ED > ED Hospitalizations

Community ED = Non-ED

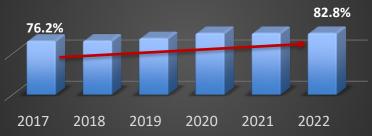


Complexity Metrics: As a group

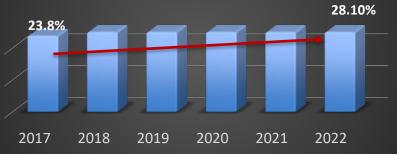
Hospitalization Rate



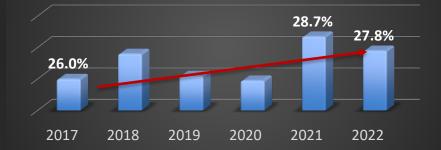
High Acuity Profee Codes



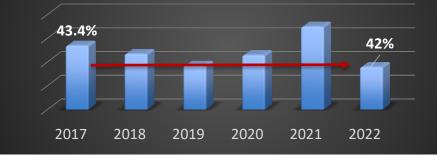
Acuity 1/2



EMS Arrivals



EMS Admissions



AAAEAAEAA

Operations Based Complexity Index

Complexity Index: Data Preprocessing and Methodological Comparison

AAAEM/AACEM Benchmark Committee and Roundtable Analytics, Inc.

February 28, 2020

Produce an Index Score and Rank for each Academic Center

- Number of Arrivals
- Ratio of % ESI-1/2 to % ESI-4/5
- % ED Arrivals Hospitalized
- % Arrivals by EMS
- % EMS Arrivals Hospitalized
- % Profee 4/5/CC

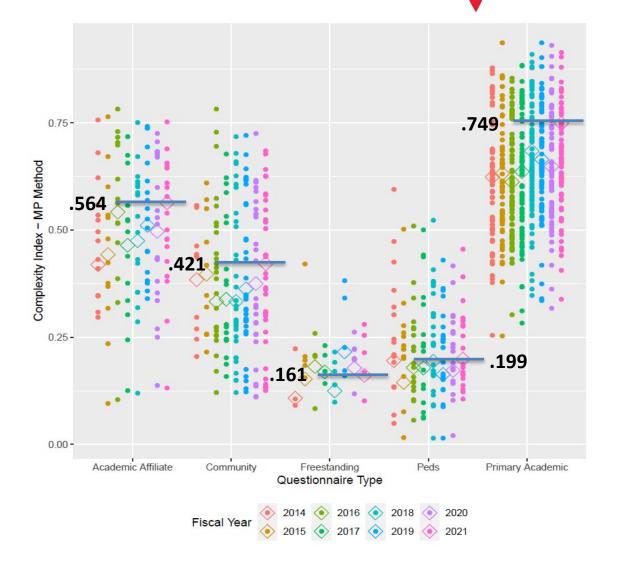
4 Versions of Complexity Index Principal Component Analysis Blended Versions



Operations Based Complexity Index

Fiscal Year 2021

- Hospitalization rate
- EMS Arrivals
- EMS Admissions
- High Acuity Codes
- Acuity 1&2 vs 3&4



Operations Based Complexity Index

Complexity Index Ranking

	¥			
University 🔽	ED Type 🔽	Complexity Index 💌	Overall Ran	ED Type R 💌
University of Massachusetts / Baystate	Primary Academic	0.942708333	1	1
University of Florida, Gainesville	Primary Academic	0.902083333	2	2
The Ohio State University	Primary Academic	0.890625	3	3
Harvard University / Beth Israel Deaconess	Primary Academic	0.88125	4	4
Medical College of Wisconsin	Primary Academic	0.877083333	5	5
University of Kansas School of Medicine	Primary Academic	0.864583333	6	6
Vanderbilt University	Primary Academic	0.855208333	7	7
Virginia Tech University	Primary Academic	0.845833333	8	8
Harvard Medical School	Primary Academic	0.840625	9	9
University of Texas Health Sciences - Houston	Primary Academic	0.817708333	10	10
Washington University @ St. Louis	Primary Academic	0.796875	11	11
University of Texas, Southwestern	Academic Affiliate	0.788541667	12	1
Yale University	Primary Academic	0.7875	13	12
Loma Linda University	Primary Academic	0.780208333	14	13
Penn State University	Primary Academic	0.778125	15	14
University of Michigan	Primary Academic	0.777083333	16	15
University of Rochester	Primary Academic	0.777083333	17	16
Texas A&M University	Primary Academic	0.776041667	18	17
Duke University	Primary Academic	0.772916667	19	18





Patient Based Complexity

Collaboration with Vizient

- Membership PI Organization
- Most AMCs (95% of our members)
- Clinical Data Base from members

• Patient Based Complexity Measure

- Patient level data
- Encounter specific metrics: Hospital Coding
 - Demographics (Age)
 - Presentations
 - Diagnoses
 - Co-morbidities
 - Social needs

- Impact on Throughput

vizient



Heather Blonsky

Jaie Lavoie





Patient Based Complexity

Quantify differences in the complexity of cases or definition of the patient population seen in different EDs or one ED over time

- Provide context to understanding variables impacting throughput
 - Patient Clinical Data
 - Social Needs
 - Variability (Operations)



Hypothesis:

An emergency department that sees patients with more clinical needs and patients with more social needs will have longer throughput times.



Patient Based Complexity Model

Creating the Model

Initial Data Set: 4 Hospitals Vizient Clinical Data Base 280 patient level variables

Small sample size for model

Provided throughput data points 2 years of daily patient level data Principal Component Analysis Streamlined variables

On this day in the ED

- Age and co-morbidities
- Current diagnoses
 - Psychosis
 - Alcohol and/or drugs/depression
 - Trauma
- Complex history
- PCP desert and 7 day returns
- Patients from neighborhoods with high social needs (transportation domain)



Patient Based Complexity Model

Expanded the number and type of hospitals

- 10 Health Systems
 - JHHS, UC Health, Northwestern, Mass General Brigham, UMass, Michigan, Cincinnati, OSU, Jefferson, U Virginia

- 27 Hospitals

- 11 Academic Medical Centers
- 7 Large Community Hospitals (Affiliates)
- 7 Small Community Hospitals
- 2 Critical Access Hospitals



- 52 Hospitals



Summary Patient Based Model

Population most impacting operations:

- More patients
- Higher proportion of patients with chronic effects of ETOH
- Higher proportion of patients with mental health issues (Psychosis)
- Higher proportion of elderly and/or complex patients
 - More than 4 Elixhauser comorbidities
- Higher proportion of patients with oncology Dx
- Higher proportion of patients from neighborhoods with high social needs
 - Transportation challenges
 - Access to health care/PCP desert

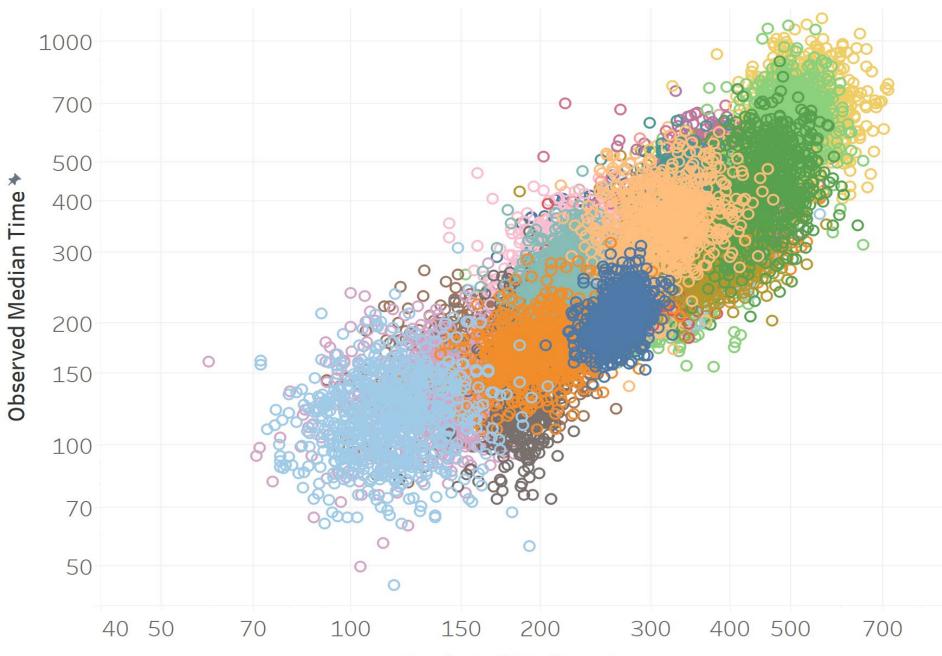


Patient Based Complexity Model

Variables provide a good fit (r² = 0.71)

- More patients
- More patients with chronic ETOH
- More patients with psychosis
- More elderly and/or with comorbidities
- More patients with oncology Dx
- Patients from neighborhoods with high social needs/PCP desert
- Reduced time = more patients with:
 - Current drug or alcohol overdose
 - History of 7-day returns to the ED
 - Severe trauma

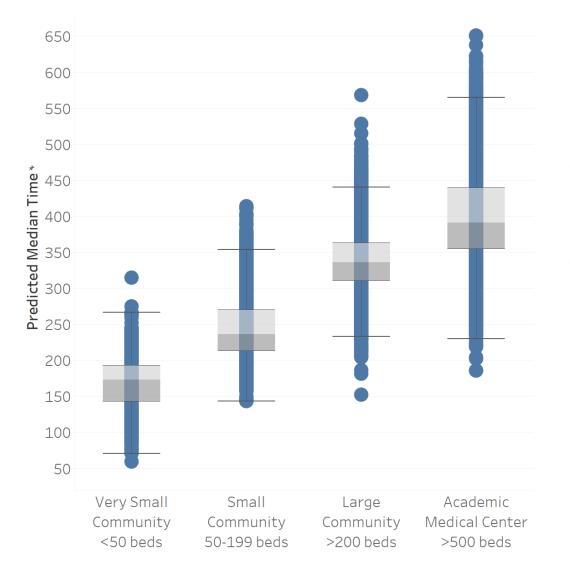
Parameter Estimates								
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t	Variance Inflation		
Intercept	1	1.72420	0.00844	204.39	<.0001	0		
logcountEncounters	1	0.26441	0.00332	79.66	<.0001	1.80271		
elderlycomplex_pct	1	0.54292	0.03768	14.41	<.0001	3.61055		
elderlyorcomplex_pct	1	0.13184	0.01351	9.76	<.0001	1.98338		
depression_pct	1	0.30474	0.02607	11.69	<.0001	2.98850		
psychosis_pct	1	0.73521	0.05640	13.04	<.0001	2.17136		
drugs_pct	1	-0.65709	0.01535	-42.81	<.0001	2.01709		
alcohol_chronic_pct	1	1.38677	0.09917	13.98	<.0001	1.08316		
hf_pct	1	0.42824	0.04181	10.24	<.0001	2.38631		
ami_pct	1	1.39015	0.12972	10.72	<.0001	1.05410		
oncology_pct	1	0.53311	0.02819	18.91	<.0001	2.10574		
stroke_pct	1	0.49120	0.09667	5.08	<.0001	1.38436		
covid_pct	1	0.17618	0.01594	11.06	<.0001	1.02545		
trauma_pct	1	0.56129	0.02515	22.31	<.0001	2.20454		
trauma_severe_pct	1	-0.77730	0.02538	-30.62	<.0001	2.58417		
vvi_pct	1	0.23934	0.00489	48.99	<.0001	2.41054		
transportation_pct	1	0.14704	0.00366	40.22	<.0001	1.62815		
access_pct	1	1.39098	0.08132	17.10	<.0001	1.11890		
pcp_pct	1	0.06822	0.00504	13.54	<.0001	1.58394		
ed7day_pct	1	-0.15454	0.01771	-8.72	<.0001	1.61210		



Predicted Median Time *

All

Patient Based Complexity Model

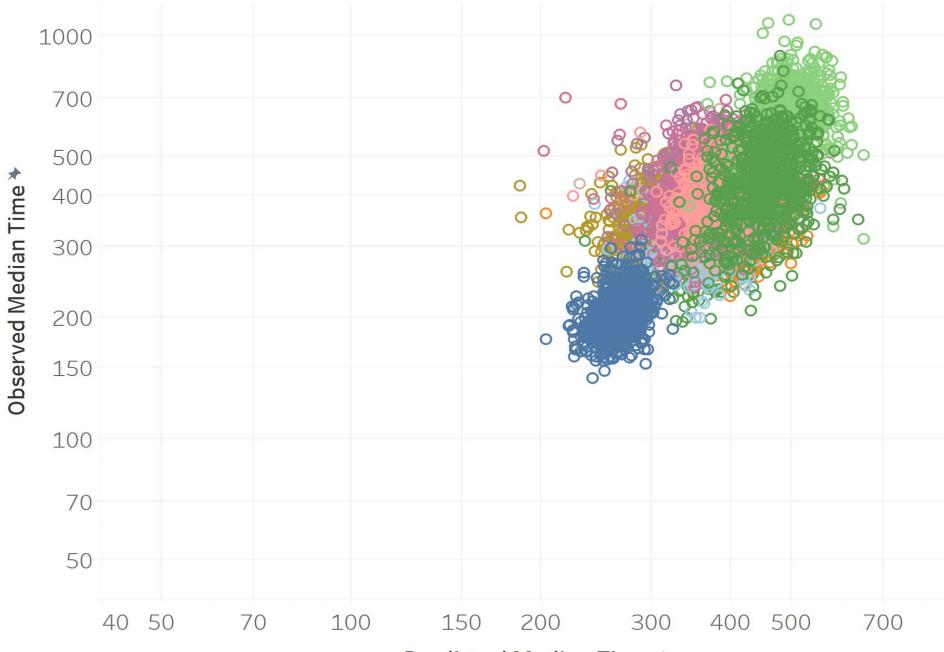


Higher complexity for AMCs than for any other cohort

Highest complexity within any one cohort tends to include higher numbers of patients with increased social needs

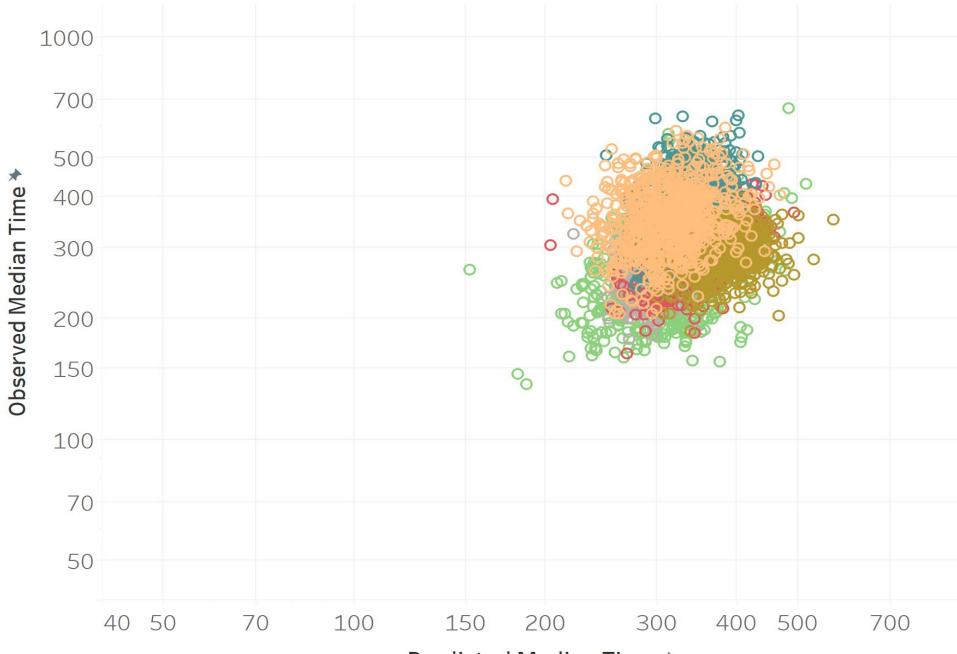


Academic Medical Center



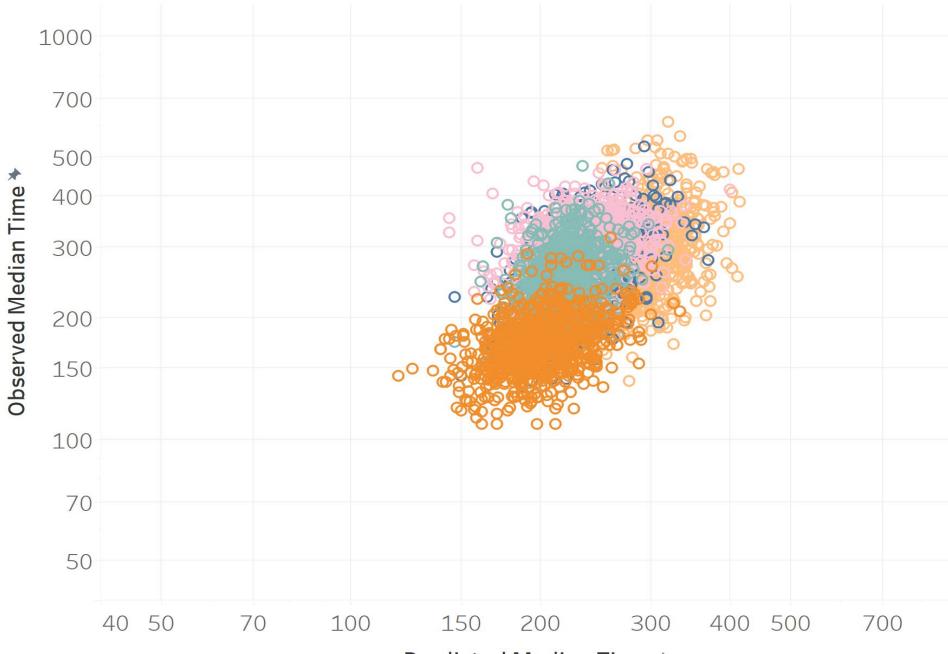
Predicted Median Time *

Large Community



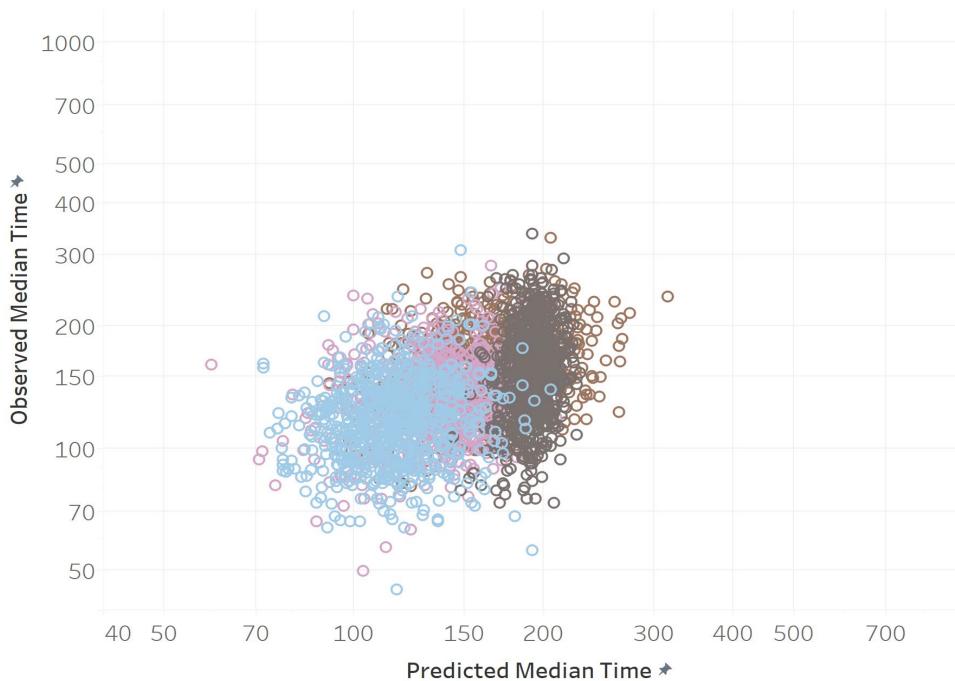
Predicted Median Time *

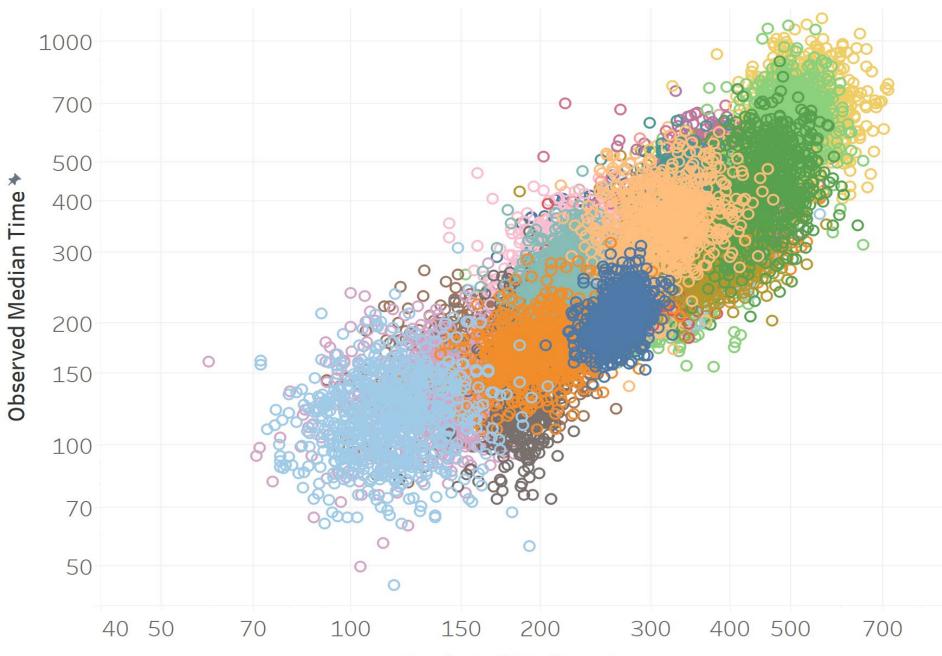
Small Community



Predicted Median Time *

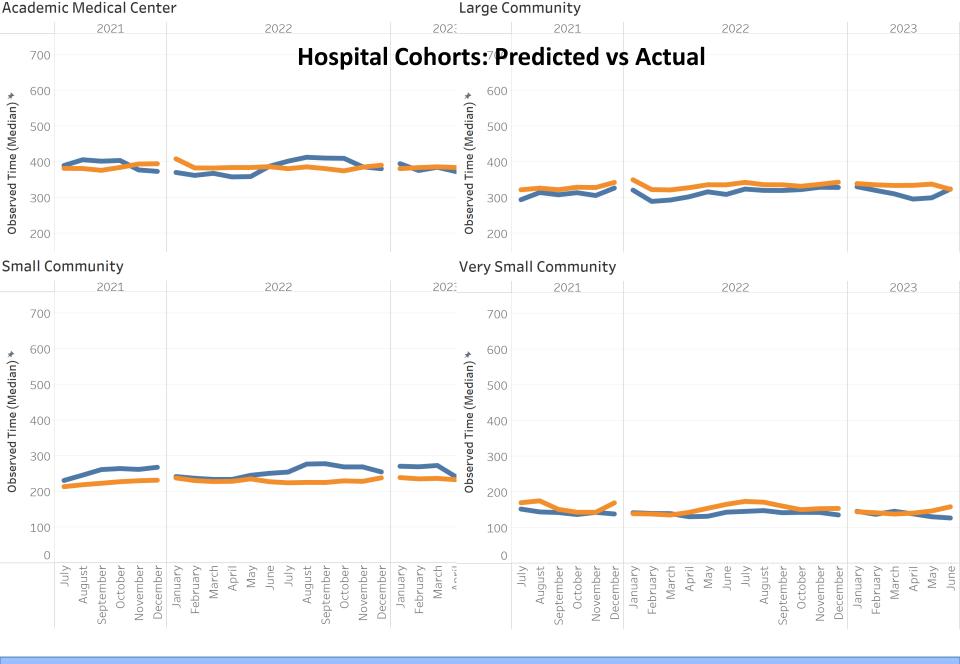
Very Small Community



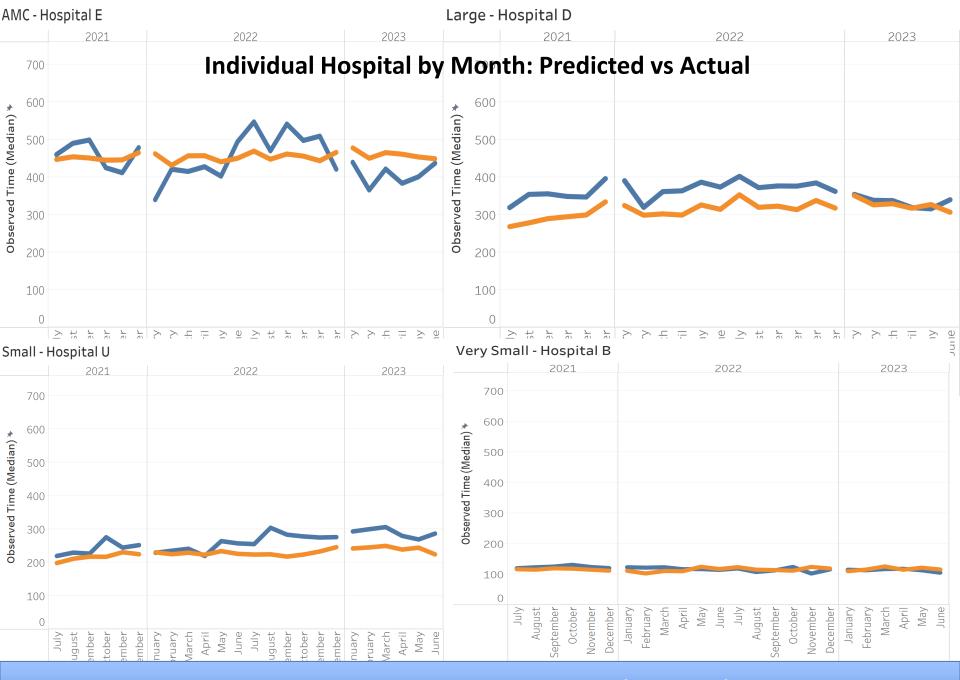


Predicted Median Time *

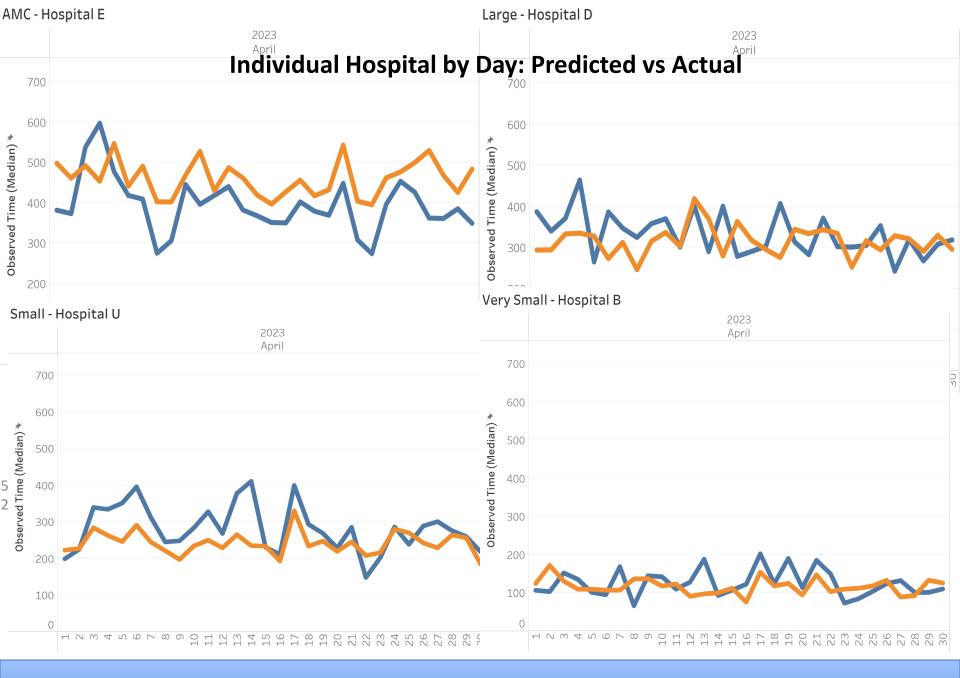
All



Low variability at the cohort level



Low variability at the hospital level (Monthly)



Expected variability at the hospital level BY DAY

Conclusion

Emergency Departments that care for patients with *more clinical and social needs* can expect *longer throughput times* than those who care for a population with fewer clinical and social needs.





Patient Based Complexity Model

Use Case:

- Build a cohort
- Demonstrate comparison
- Observed over Expected

Next Steps:

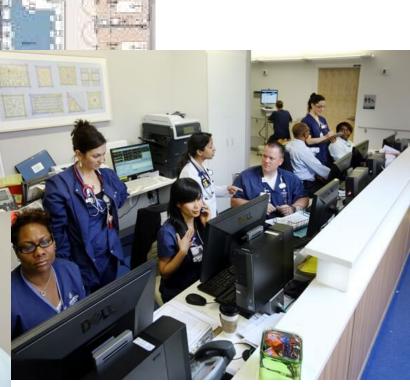
- Finalize model
- Add impact of boarding
- Data access/Rollout



Implications



27





THANK YOU

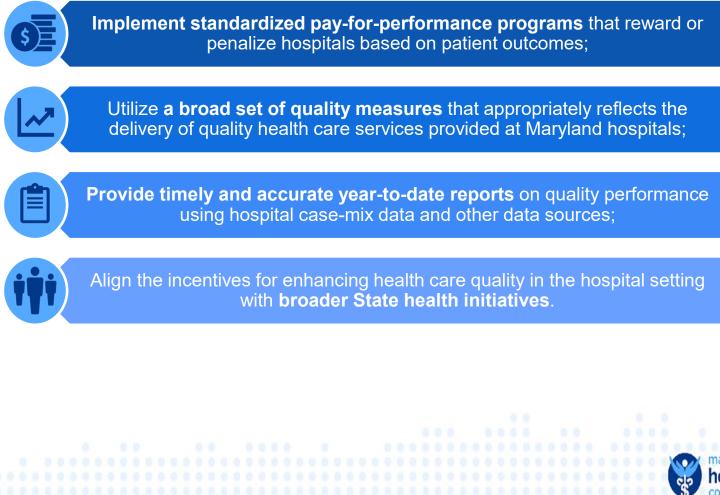




Emergency Department and Hospital Throughput Best Practices Draft Policy



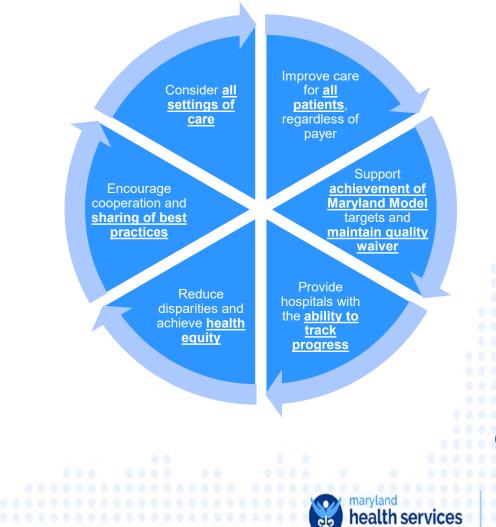
HSCRC Quality Program Goals



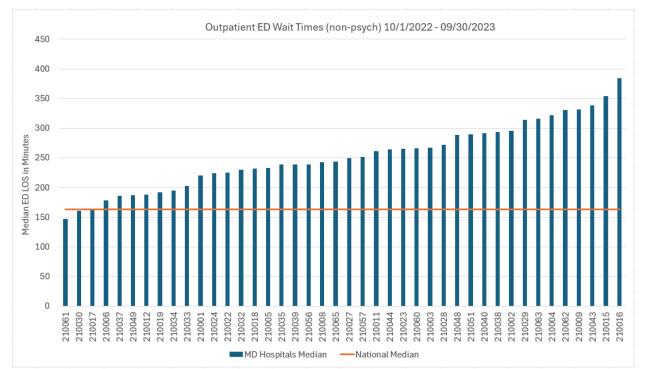


HSCRC Quality Program Guiding Principles

 The mission of the HSCRC Quality Program is to create all-payer financial incentives for Maryland hospitals to provide efficient, high quality patient care, and to support delivery system improvements across the State.



Why Focus on Emergency Department Length of Stay?



health services

ED Best Practices Incentive Policy Development

Commission leadership directive: Identify 3-5 best practice measures that will constitute a +/- 1% revenue at risk program for CY 2025 performance.

Policy Goal:

- Develop structural or process measures that will address systematically longer ED length of stay (LOS) in the State.
- Promote adoption of hospital best practices by providing GBR financial incentives.
- Align hospital initiatives with the goals of the ED Wait Time Reduction Commission.

Steps

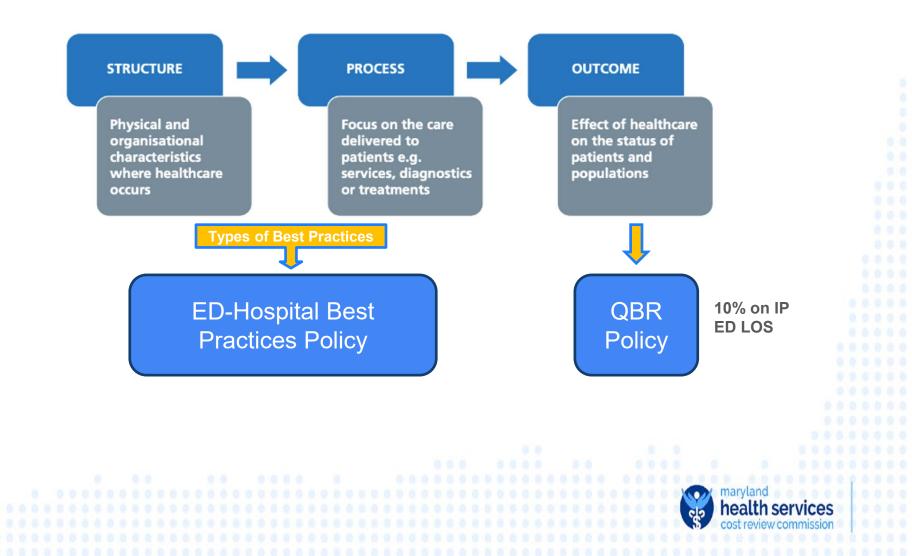
1. Finalize a set of hospital best practices and tiers to improve overall hospital throughput and reduce ED length of stay

RY 2027/CY 2025

- 2. Develop data collection and auditing
- 3. Implement statewide monitoring reports
- 4. Propose RY 2028 policy with revenue at-risk and scaled financial incentives



The Donabedian Model for Quality of Care



DRAFT RECOMMENDATIONS FOR RY 2027 (CY 2025 PERFORMANCE PERIOD)

Final Policy February 2025

1.Building upon the ongoing work of staff and key stakeholders, refine the specifications developed by the Best Practice subgroup on a set of up to six Hospital Best Practices that are designed to improve emergency department (ED) and hospital throughput and reduce ED length of stay (LOS).

• For each best practice identified, develop three weighted tiers with corresponding measures that reflect the fidelity and intensity of each best practice.

2.Require hospitals to select two Best Practices to implement and report data on for RY 2027.

• Failure to implement and report data to the Commission by October 2025 will result in a 0.1 percent penalty on all-payer, inpatient revenue to be assessed in January 2026.

3.We propose that subsequent rate years will have 0.25 percent inpatient hospital revenue at risk tied to performance on these best practice metrics but intend to evaluate the impact of the best practices and make a final recommendation for subsequent rate years after the Year 1 Best Practice program impact is assessed.



Final Six Best Practices Selected

Each hospital will select 2 interventions from the 6 interventions below:

- Interdisciplinary Rounds
- Bed capacity Alert Process
- Standard Daily/Shift Huddles
- Expedited Care Bucket (inclusive of expediting team, rapid medical evaluation team, rapid medical evaluation unit and patient observation management)
- Patient Flow Throughput PI Council
- Establishing Clinical Pathways



Examples of Best Practice Measures and Tiers

Best Practice	Measures (EXAMPLE ONLYStill in development)	Points (0-10 scale)
Interdisciplinary	Tier 1: Interdisciplinary Rounds piloted with a target of x%	Tier 1 earns 0-2 points
Rounds	on at least 1 unit	
	Tier 2: Interdisciplinary Rounds implemented on X additional units AND documentation of discharge planning initiated Day 1	Tier 2 earns up to 4 additional points (cumulative tier 1 and 2 has 6 possible points)
	Tier 3 : Leadership involvement in Interdisciplinary Rounds OR	Tier 3 earns up to 4 additional points
	Documentation of prior auth for post-acute placement by	
	x timeframe; specialist consults completed within 24	
	hours of order, etc.	
Bed Capacity	Tier 1: Bed capacity Alert triggered at a certain surge level, alert	
Alert System	goes to all inpatient and outpatient areas And triggers	Tier 1 earns 0-2 points
-	mandatory leadership huddles	
	Tier 2: Bed capacity alert includes non-hospital partners (outpatient providers, local post-acute facilities)	Tier 2 earns up to 4 additional points (cumulative tier 1 and 2 has 6 possible points)
	Tier 3: Leverage Access centers and CRISP to facilitate most appropriate patient placement; potentially partner with MIEMSS long-term	Tier 3 earns up to 4 additional points
Standardized Daily/Shift	TBD-tier development and metrics in process, initial discussions	Tier 1 earns 0-2 points
Huddles	focused on integrating ED census, wait time etc. into huddles, as well as linkage to interdisciplinary rounds	Tier 2 earns up to 4 additional points (cumulative tier 1 and 2 has 6 possible points)
		Tier 3 earns up to 4 additional points

Examples of Best Practice Measures and Tiers

Expedited Care	Proposal 1: select one or more of multiple expediting practices	Tier 1 earns 0-2 points	
Intervention	Nurse expediter		
(Expediting team, expedited	Tier 1: Designated RN for admission/discharge planning/coordination	Tier 2 earns up to 4 additional points (cumulative tier 1 and 2 has 6	
care unit)	Tier 2: Tier 1 & x% decrease in discharge order to discharge time for D/C to	possible points)	
	Home pts	Tier 3 earns up to 4 additional points	
	Tier 3: Tier 1 & 2 plus (x+5% decrease in discharge order time for D/C to Home	The S earns up to 4 additional points	
	Discharge Lounge		
	Tier 1: Designated clinical space & staff to discharge patients from a Discharge		
	lounge		
	Tier 2: Tier 1 & (x%) decrease to discharge order to discharge time		
	Tier 3: Tier 1, 2 & (x+5%) decrease in discharge order to discharge time		
	Observation Unit		
	Tier 1: Dedicated clinical space and staffing for short stay patients		
	Tier 2: Tier 1 & Decrease in Total Obs (ED Obs & Hospital Obs) LOS		
	Tier 3: Tier 1 & 2 & (x+5%) Decrease in Total Obs LOS		
	Proposal 2: Develop/ implement processes & specific metrics,		
	mandatory sharing across hospitals and reporting to HSCRC; define		
	targets over CY25 in order to prevent unintended consequences		
Patient Flow Throughput	Tier 1: Established Patient Flow Throughput Performance Council with front-line and	Tier 1 earns 0-2 points	
Performance Council	leadership representation, meets at least monthly		
	Tier 2: Council tracks and implements specific interventions targeted at decreasing inpatient LOS	Tier 2 earns up to 4 additional points (cumulative tier 1 and 2 has 6 possible points)	
	Tier 3: Leadership has strategic goals for each department tied to patient flow throughput	possible politic)	
		Tier 3 earns up to 4 additional points	
Clinical Pathways/Observation	TBD: currently focused on evidence-based pathways that facilitate care across the	Tier 1 earns 0-2 points	
Management	continuum with overarching goal of enhancing and expediting care		
. . . .	Example: Chest pain protocol that leverages nurse driven protocol and/or expedited evaluation in an	Tier 2 earns up to 4 additional points (cumulative tier 1 and 2 has 6	
	outpatient setting if clinically appropriate & expedited protocol for inpatients.	possible points)	
		Tier 3 earns up to 4 additional points	

Standard Daily Shift Huddles Proposal

The AHRQ defines a huddle as a short, standing meeting that is typically used in clinical settings to quickly share important information and touch base with a team, typically held at the beginning of each workday or shift. This subgroup was tasked with building tiers for consideration as well as to present any barriers or opportunities identified by the group. Proposed tiers are defined below.

•	Tier 1: Implementation of, at minimum, daily and/or shift huddles utilizing a multidisciplinary team						
•	approach with a focus on throughput and discharges.						
•	Tier 2: Tier 1 requirements with the addition of standard scripting, documentation, and/or use of huddle						
•	boards. Tier 2 would also include an escalation process for addressing clinical and/or non-clinical						
•	barriers to discharge or throughput.						
•	Tier 3: Tier 1 and Tier 2 requirements, with the addition of monitoring and reporting of key performance						
•	indicators (KPIs) as drivers of process improvement during huddles.						
•	• Example KPIs could include but are not limited to:						
	•	the HCAHPS discharge domain, percent of discharge orders written by noon, or percent					
	•	patients leaving the facility by a designated time as determined by each facility.					
	•	Group discussion relating to barriers to these tiers included the consideration of ensuring each facility					
	•	can operationalize these metrics to best fit their organizational needs. A global approach to tier					
	•	development is supported to limit the need for additional resources and financial burdens on					
	•	organizations as well as provides each organization the ability to customize their approach to drive					
	•	performance specific to their demographics and population.					



Commissioner Feedback on Best Practices Proposal for Discussion

- Consider simplifying tiers—can we design an overall measure with specific targets for each best practice?
- Request for brief justification of best practices selected-why the 2 were chosen for a particular hospital
- Consideration of MVP (Multi-Visit Patients) impact, will any of the best practices address MVP issues
- Discuss concerns regarding administrative burden and unintended consequences of measures
- Consider Best Practice work is a foundation for Quality Improvement Partnership



Next Steps

•

- Continue development of measure definition, tiers, and targets with hospital groups
- Comment period through 1/17 • Final policy presented to HSCRC Commission on 2/12 •