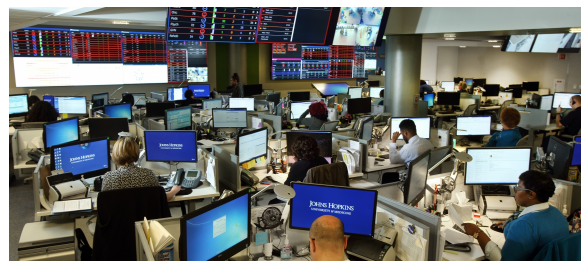


Emergency Department Operations

*Boarding
Bed Utilization
Occupancy
Crowding
Hospital Operations*



Jim Scheulen
On behalf of the
AAAEM Benchmark Committee
May 2019



Boarding is...

- A primary cause of ED crowding
- A major contributor to extended LOS for all
- A safety issue
- A nearly universal issue
- ***A natural consequence***
 - *Directly related to inpatient occupancy*
 - *Downsizing the hospital industry*
 - *Health care trends—our patient population*

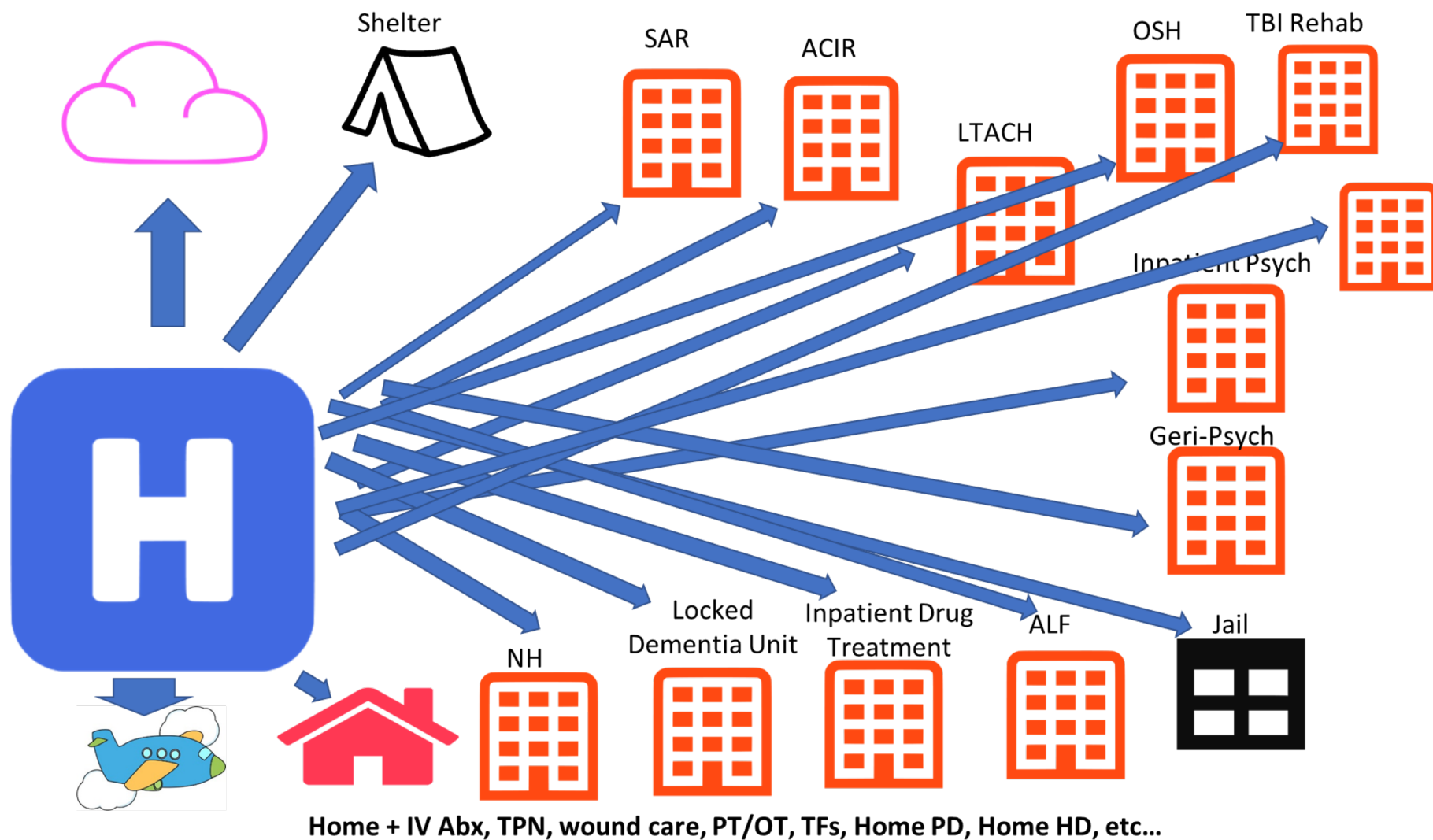
The fundamental issue

Hospital and Inpatient Bed Closures

Wringing out “excess capacity”

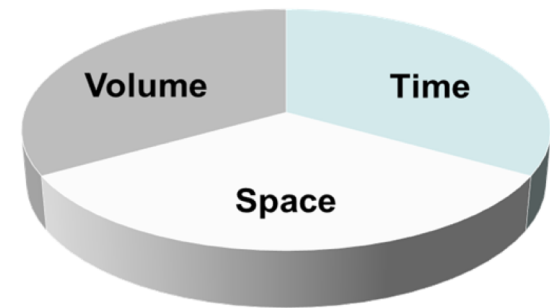
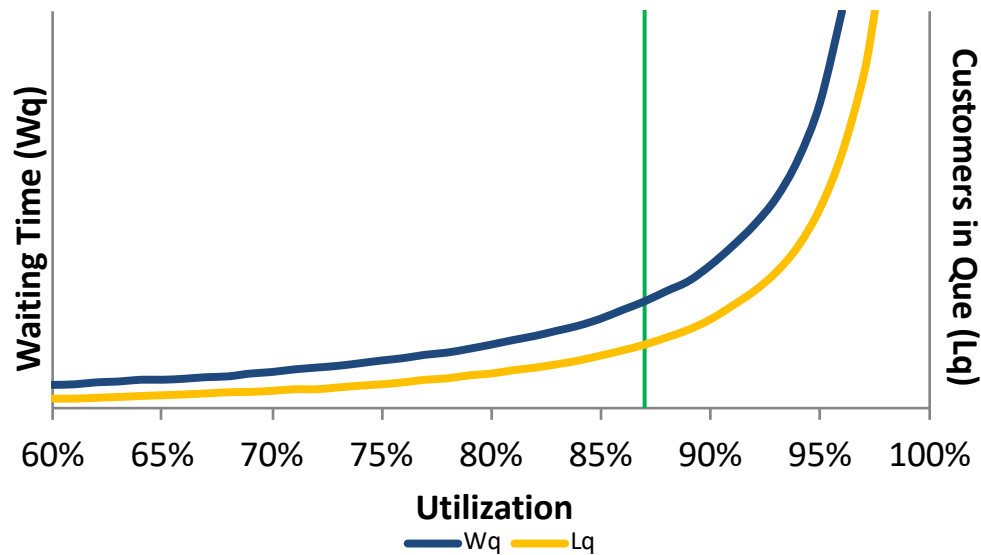
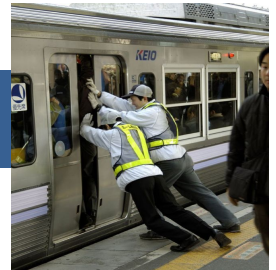


A Natural Consequence



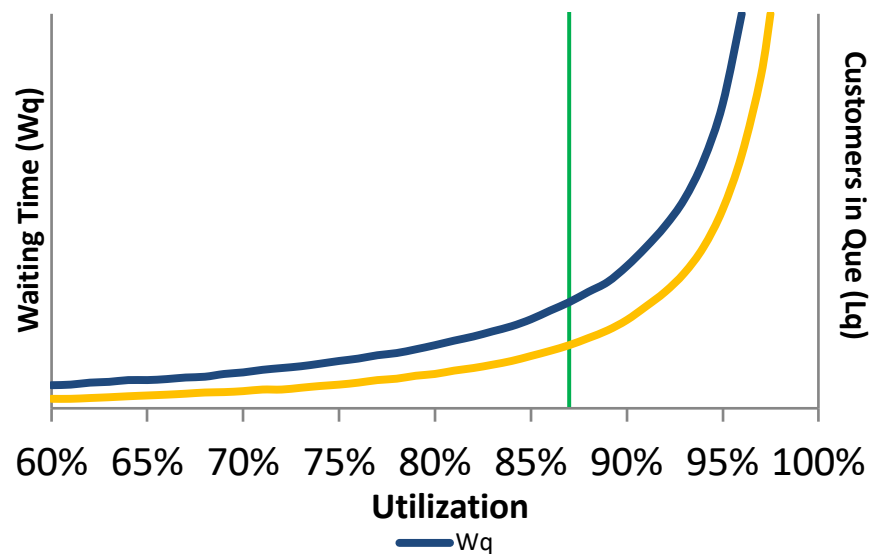
A Natural Consequence

High Demand for Fixed Resources

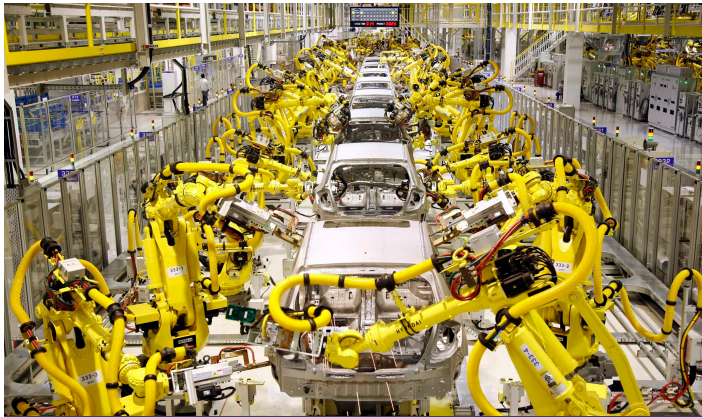


A Natural Consequence

High Demand for Fixed Resources



A Natural Consequence



Production Line

Throughput: 182,500 annually
Stations: 8
Cycle time: 26 minutes
Utilization: 99%

No variation in arrivals
No variation in process
Low cycle time
Cycle time variation is minutes



Hospital

Throughput: 50,368 annually
Stations: 1,059
Cycle time: 6.2 days
Utilization: 85%

Arrivals not fully controlled
Complexity not controlled
High cycle time
Cycle time variation is days

Our Boarding Experience

- **Information Sources**

- Benchmark Survey
- Focused survey from subset of AMCs
 - *Cognitive load*
 - *Patient flow information*
 - *Boarding in real time*

- **High Level Statements**

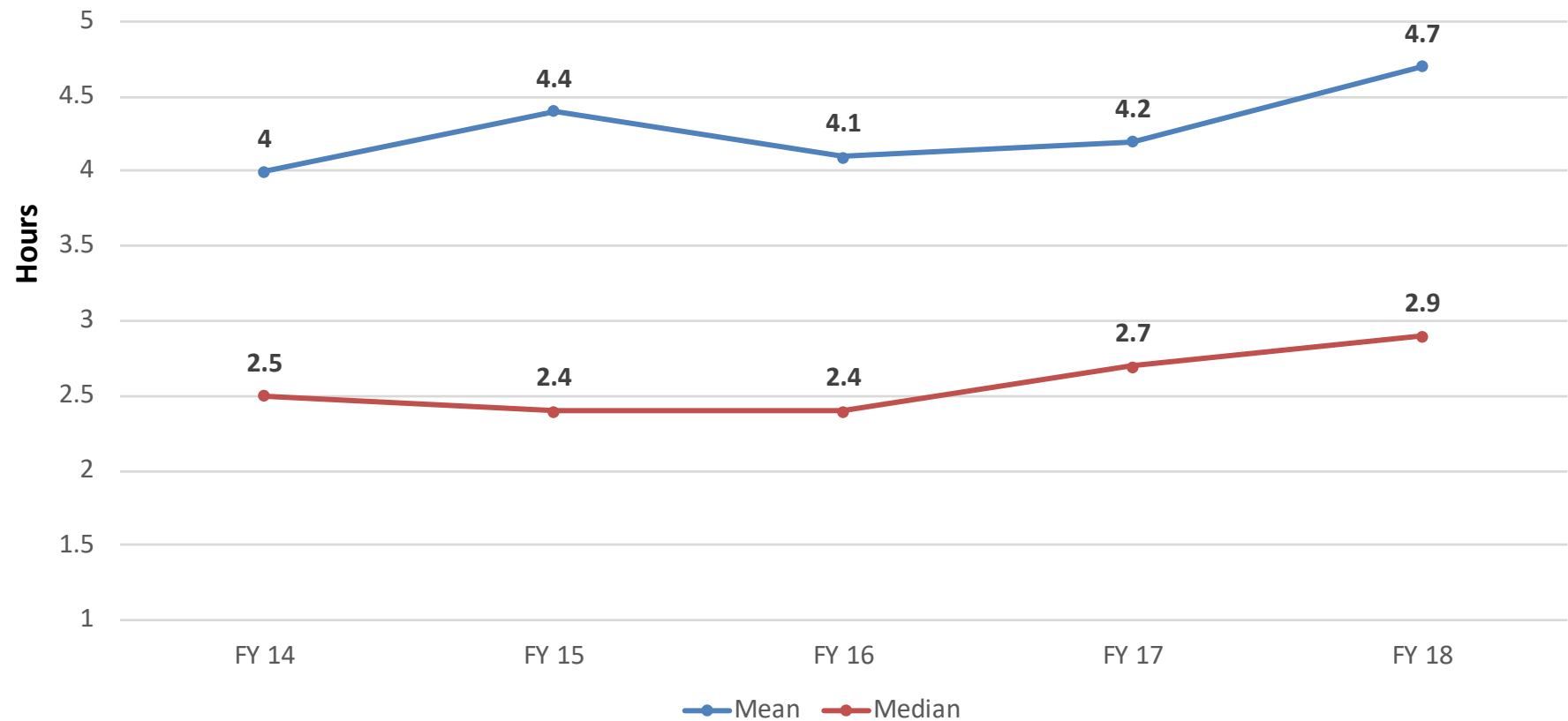
- Boarding distributions vs Mean
- Cohorts are important
- Consider resource utilization
 - Boarding Hours and Bed Hour Utilization
- We have a healthcare “system” issue



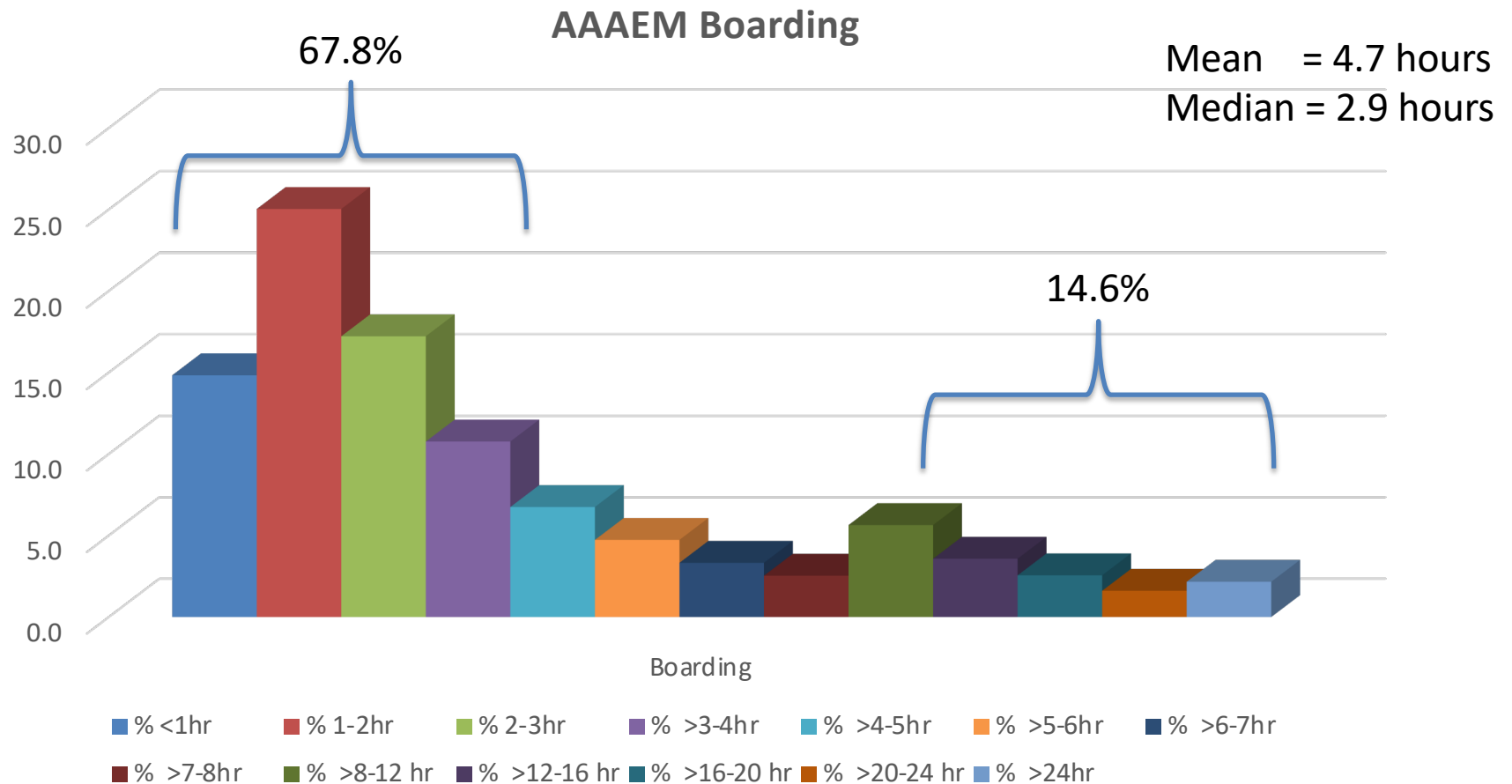
Benchmark Survey

Boarding Time

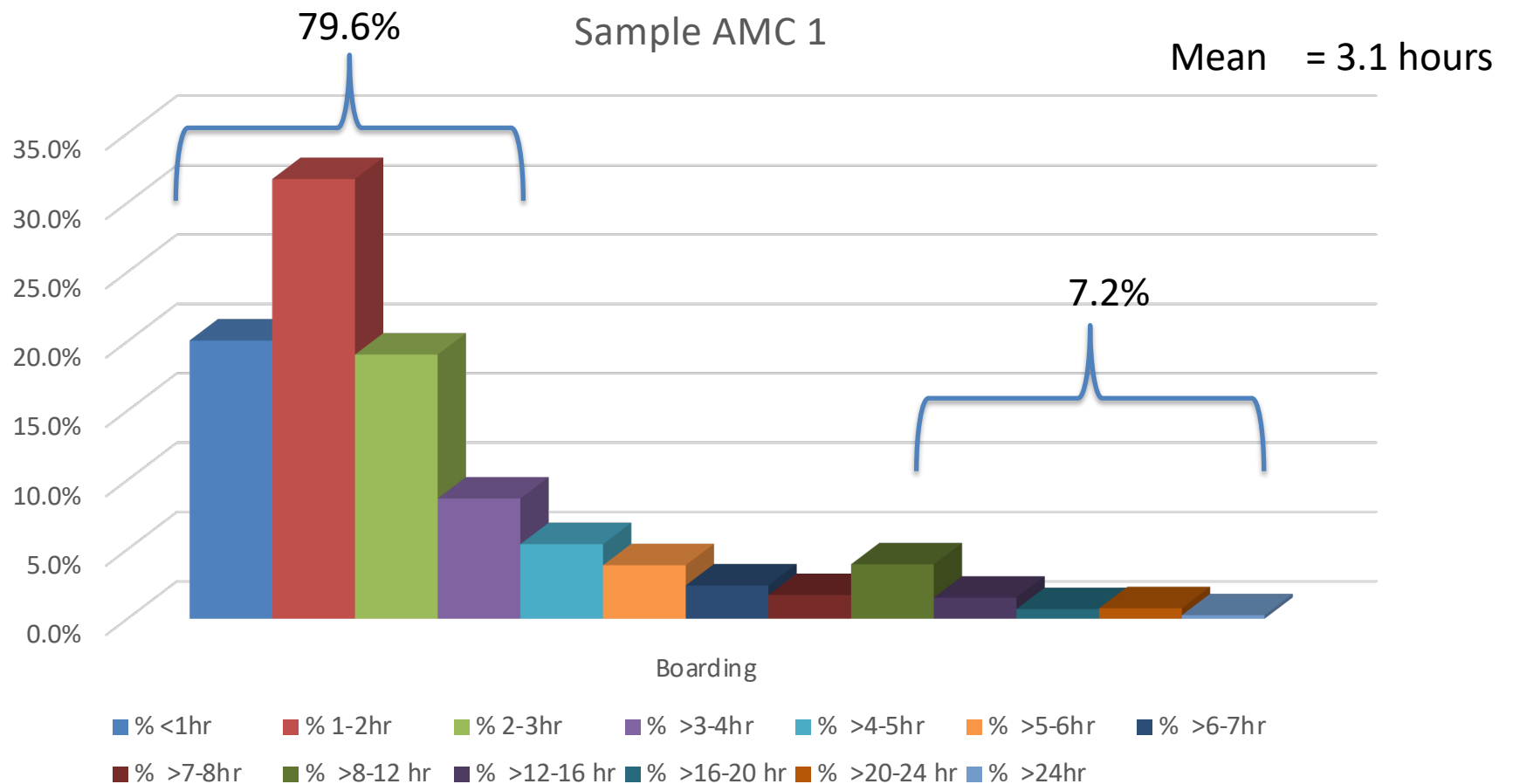
Mean and Median Boarding Times



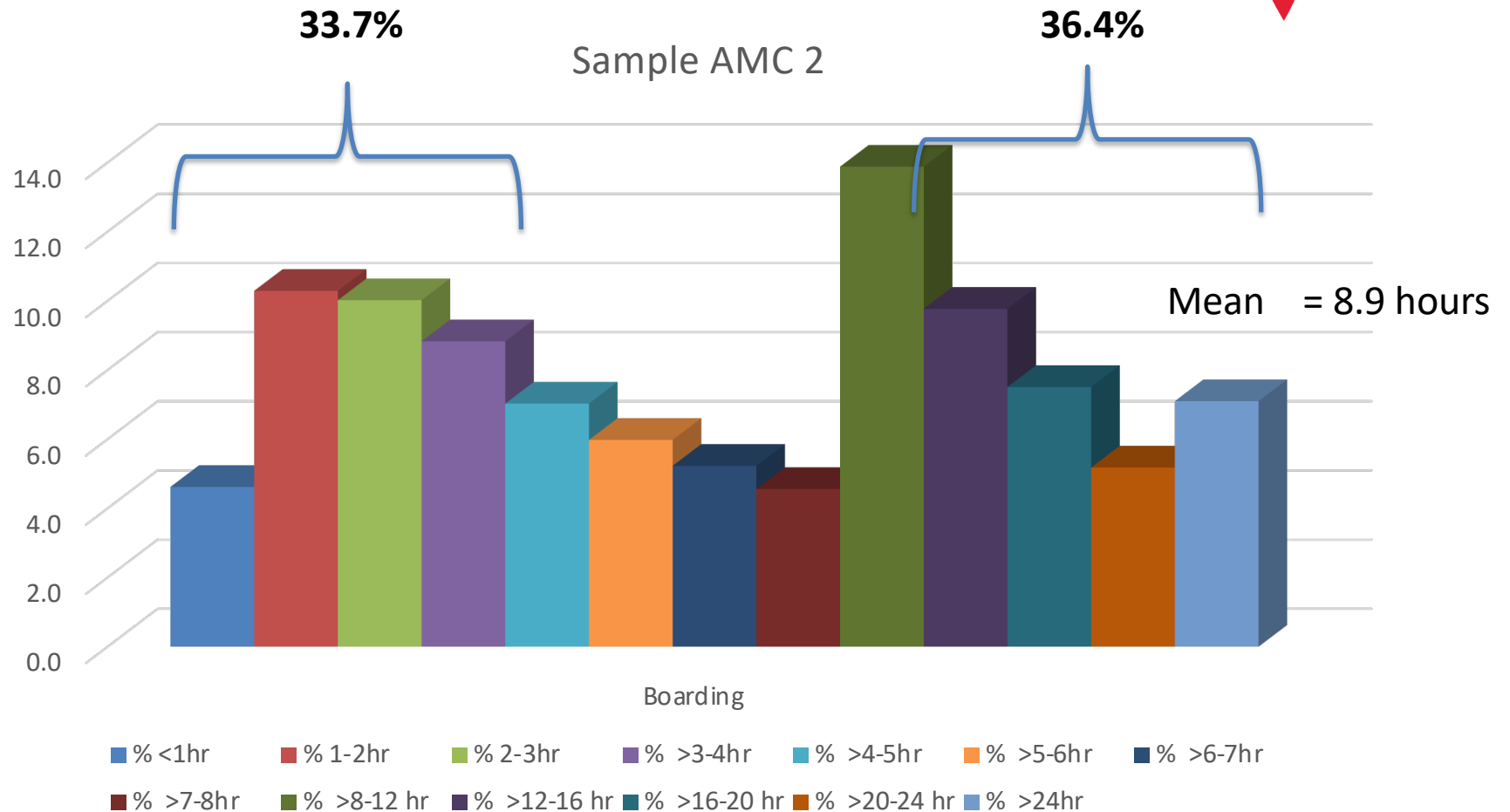
Boarding distribution



Boarding distribution

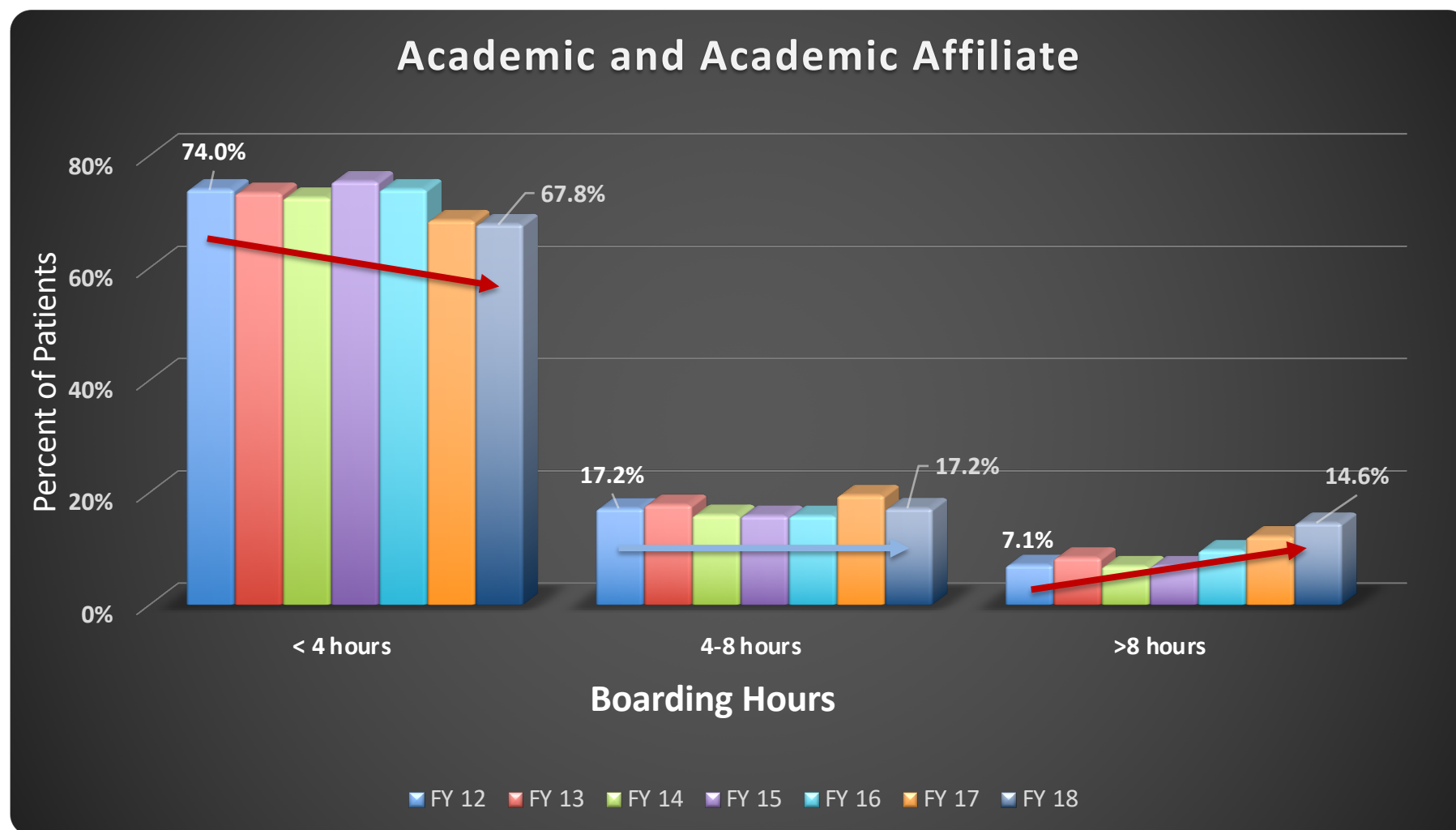


Boarding distribution

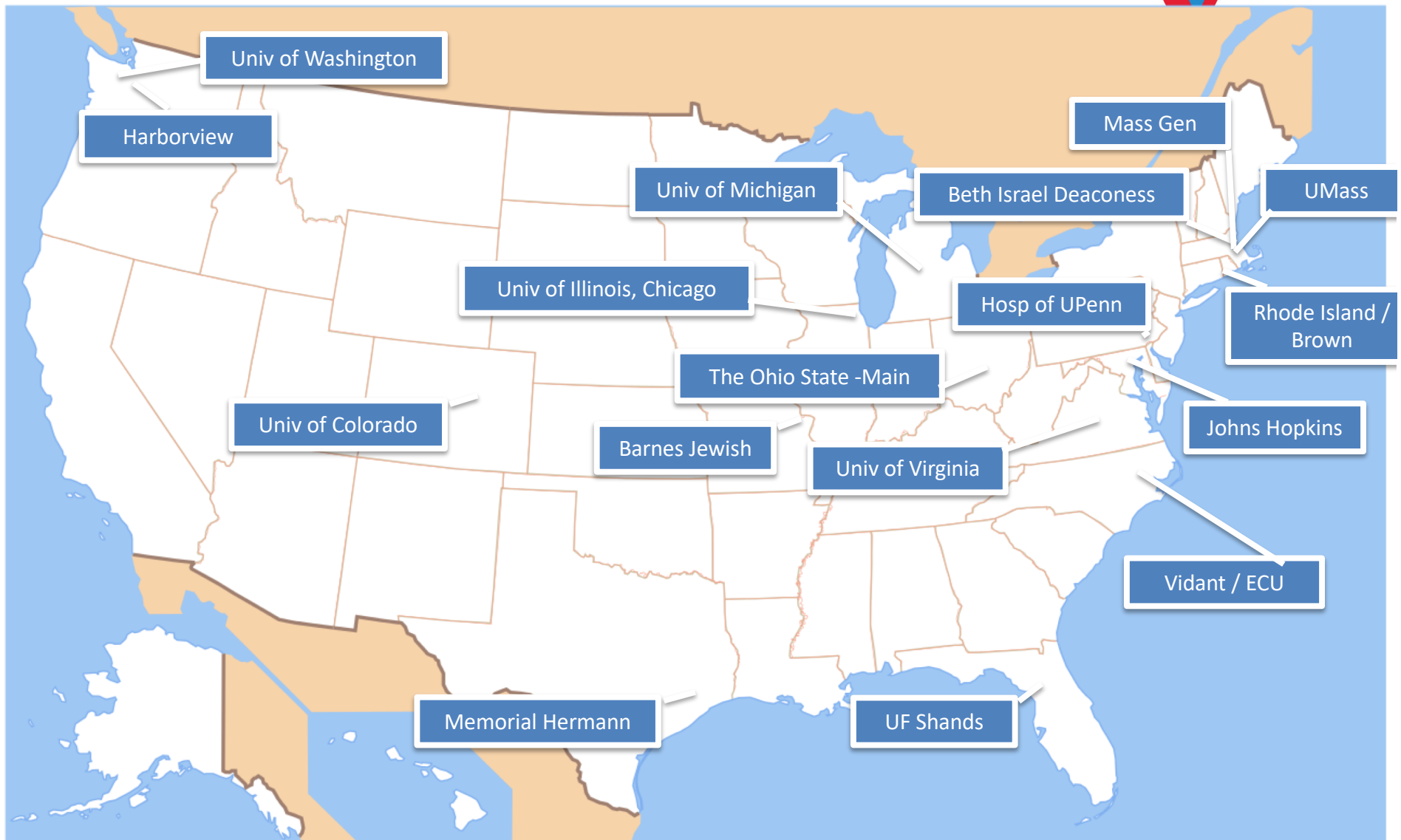


Boarding Distribution

FY 2012 vs FY 2018



Monthly Survey Participants



Our Boarding Experience

Care for the boarding patient in the Emergency Department?

Benchmark Survey (n=90)

- **47% EM**
- **27% Nursing support**
- **11% Financial support**

Monthly Sample (n=16)

- **67% EM**
- **33% Nursing support**
- **15% Financial support**

Survey Patient Population

	Mean	Median
Total Arrivals	5,855	5,318
Number of Boarders	1,738	1,728
% Arrivals Boarding	28.9%	28.0%
<i>Total Boarding Hours</i>	<i>9,830</i>	<i>11,141</i>
Boarding per Patient	6.4 hours	6.55 hours
% of patients waiting > 45 minutes	36.4%	35.9%

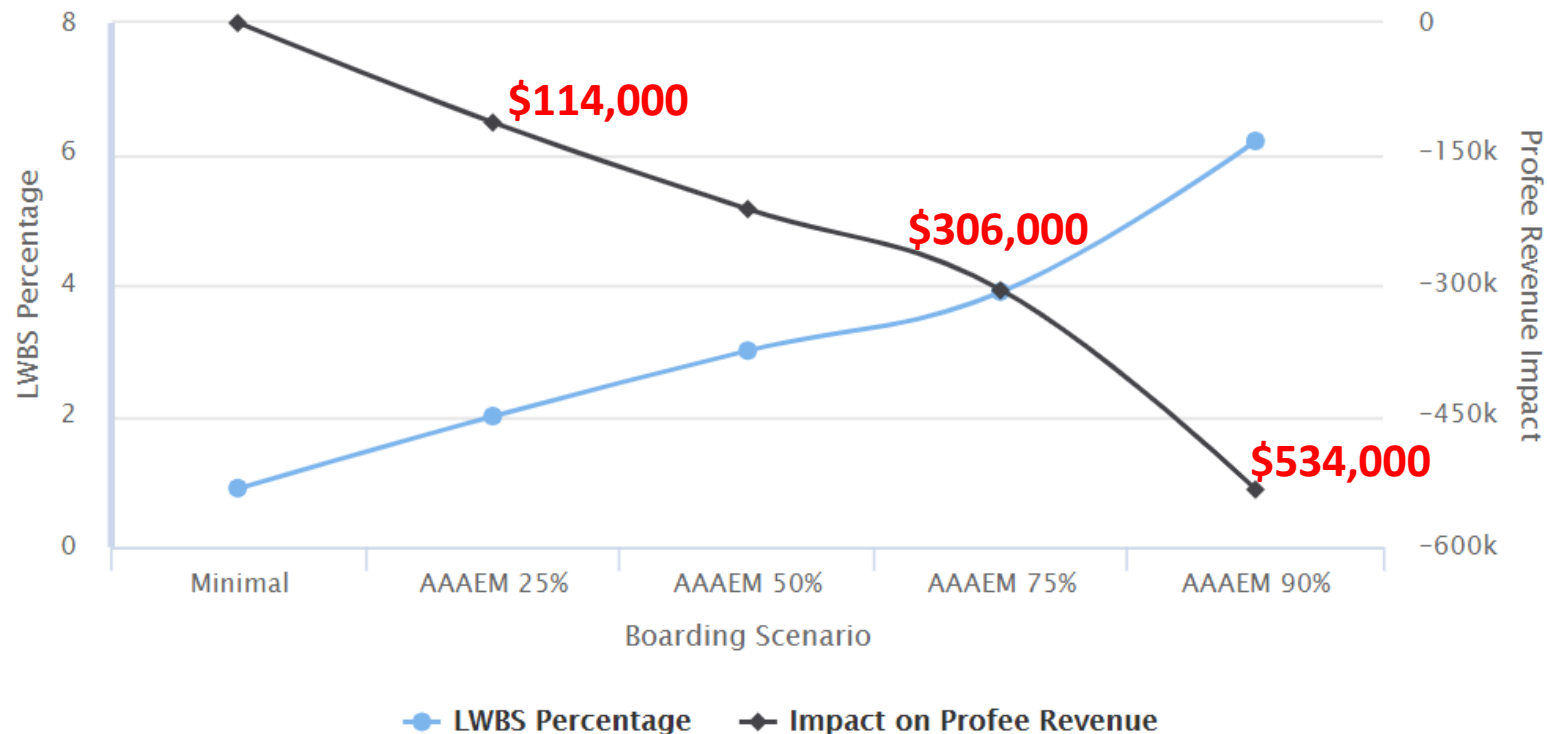
% Boarding < 4 hours = 57.9% vs AAAEM 67.8%

% Boarding > 8 hours = 22.3% vs AAAEM 14.6%

Impact of Boarding

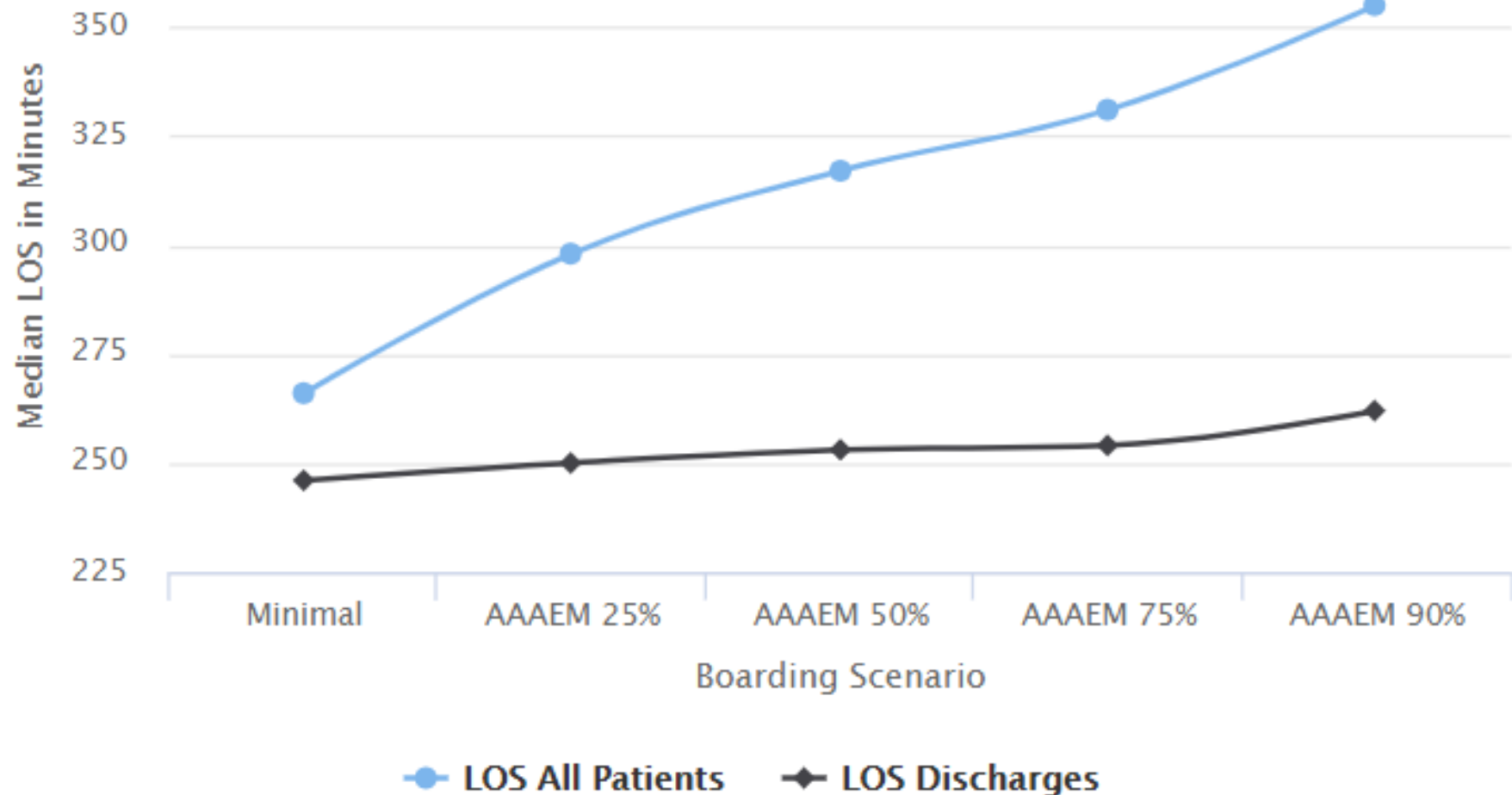
- LWBS
- Length of Stay (All patients)
- Revenue
- ED Bed Utilization

ED volume of 200 patients per day
Hold all operations the same
Vary Boarding time



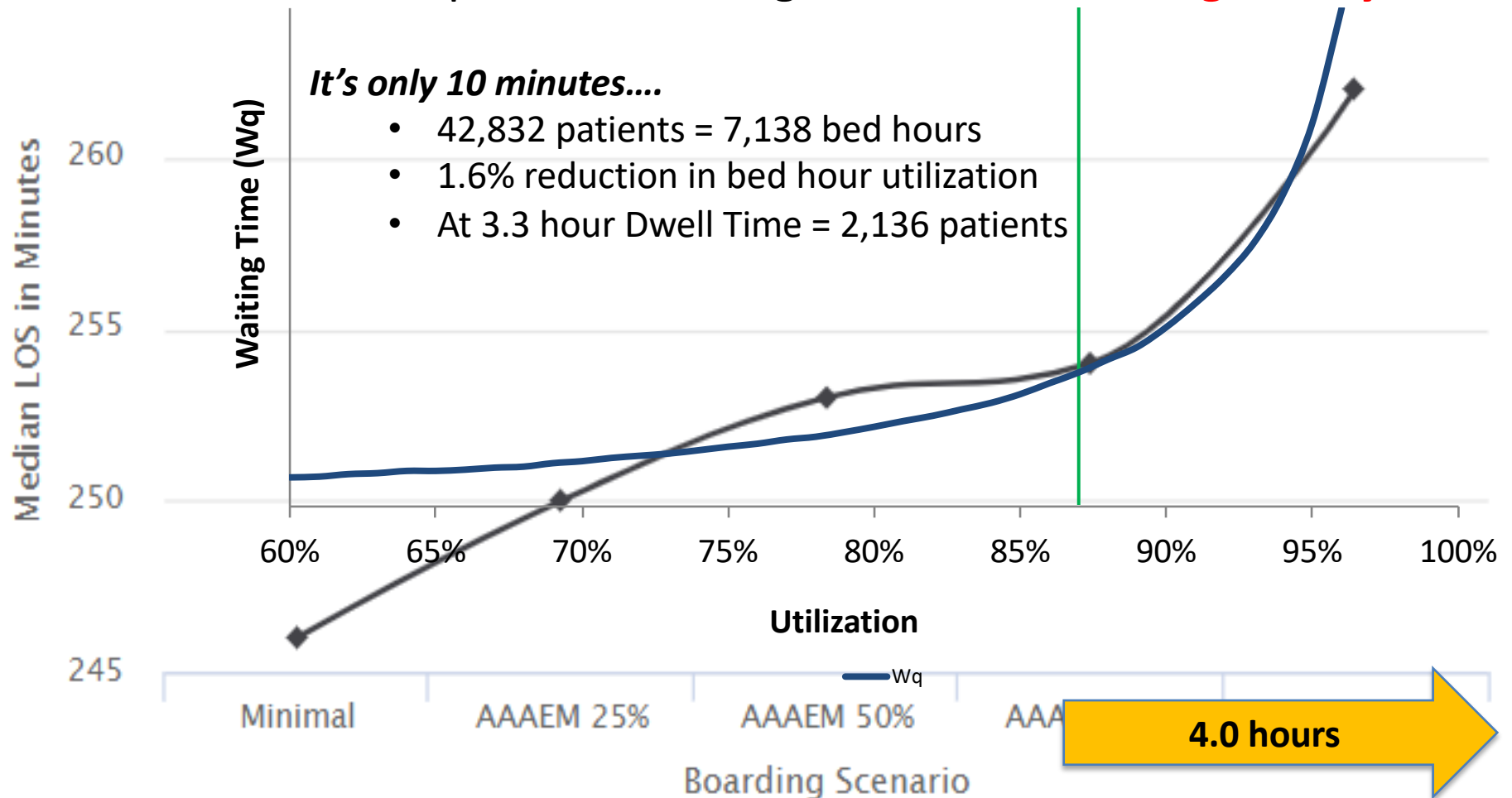
Impact of Boarding

Simulated Impact of Boarding on LOS for All Patients



Impact of Boarding

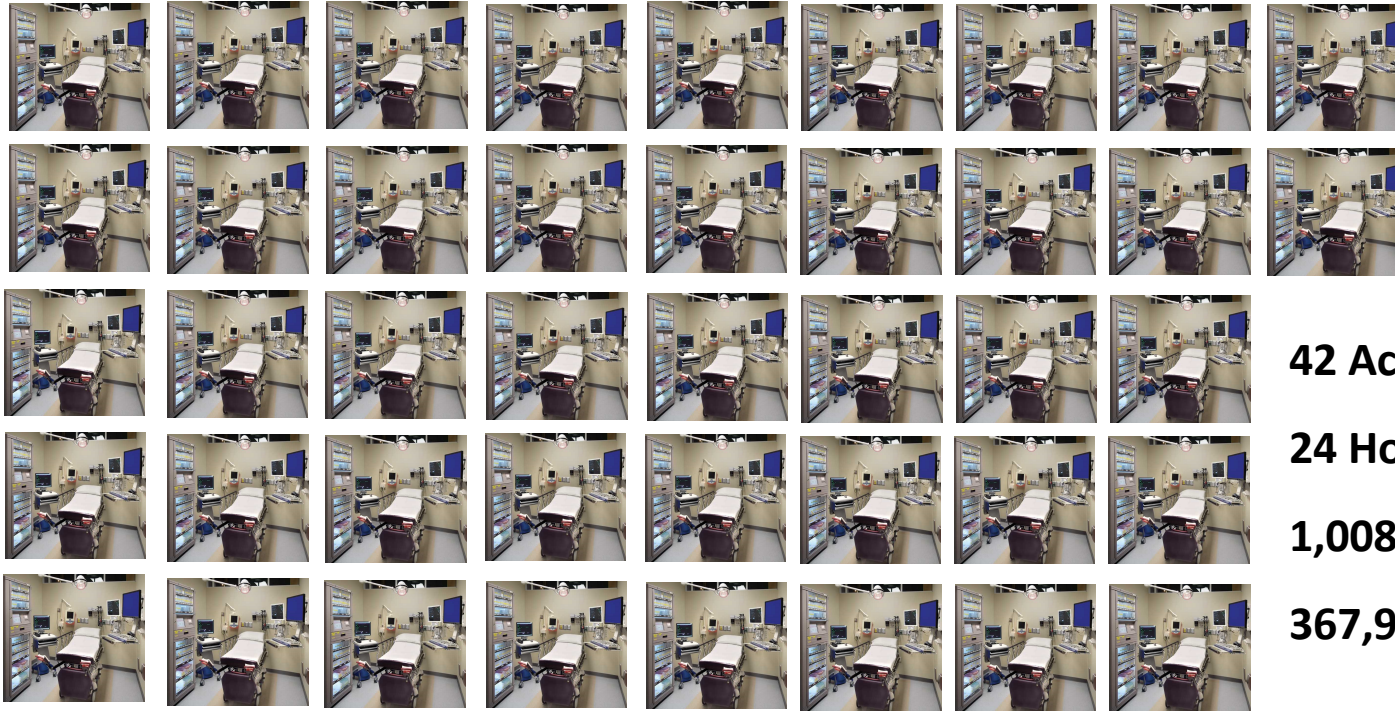
Simulated Impact of Boarding on LOS for **Discharges Only**



Bed Hour Utilization



Bed Hour Utilization



42 Acute Care Beds

24 Hours per Day

1,008 Bed Hours per Day

367,920 Bed Hours per Year

Consider demand for bed hours (Dwell time) with supply of bed hours

- What percentage of your bed hours are used in the course of a year?
- How do you use your beds?
- Designing and Sizing the Emergency Department

Impact of Boarding Bed Hour Utilization (JHH)

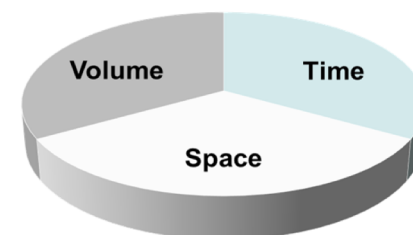
Overall 25% of population (Admits) uses 47% of bed hours

Boarding alone uses 36% of all available bed hours in this part of the ED

Admitted Patients							
Admit Volume	Admit Dwell Time in hrs	Admit LOS in hrs	Admit Dwell time as percent of total LOS	Admit Dwell as % of total bed hrs	Decision burden as percent of dwell	Boarding burden as percent of dwell time	Boarding burden as percent of total bed hours
12,309	124,061	228,507	54%	47%	23%	77%	36%

Bed hours			
Total available bed hrs a year	Available bed capacity excl br hrs	Total beds	Bed occupied by boarders (after decision is taken)
262,800	17	29	12
131,400	10	15	5
262,800	17	29	12
131,400	10	15	5
262,800	16	29	13
131,400	10	15	5

Same volume of patients
Seen in 17 beds—not 29



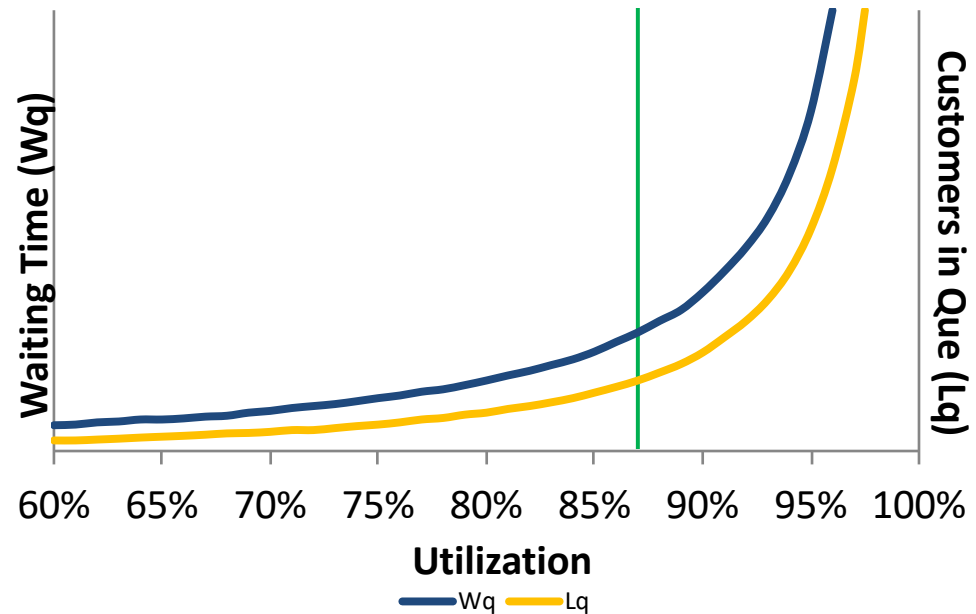
Impact of Boarding Bed Hour Utilization (AAAEM)

	Report	Annual
Total Boarding Hours	11,141	133,692
Total Main ED Bed Hours	28,470	341,640
<i>% Boarding Hours</i>		<i>39.1%</i>
# Main ED Beds	48	48
# Boarders in Main ED	17	17
<i>% Boarders in Main ED</i>		<i>35.4%</i>

BOARDING alone consumes 18 Emergency Department beds
This ED has only 30 beds or 63% of bed hours available for emergency care
Overall ED bed utilization > 91%

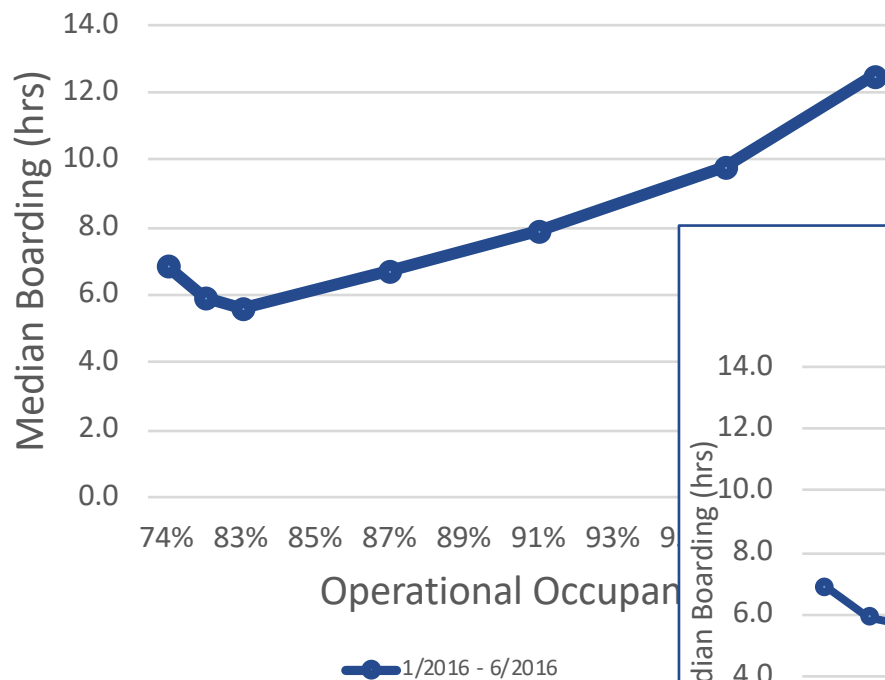
Boarding A Natural Consequence

High Demand for Fixed Resources



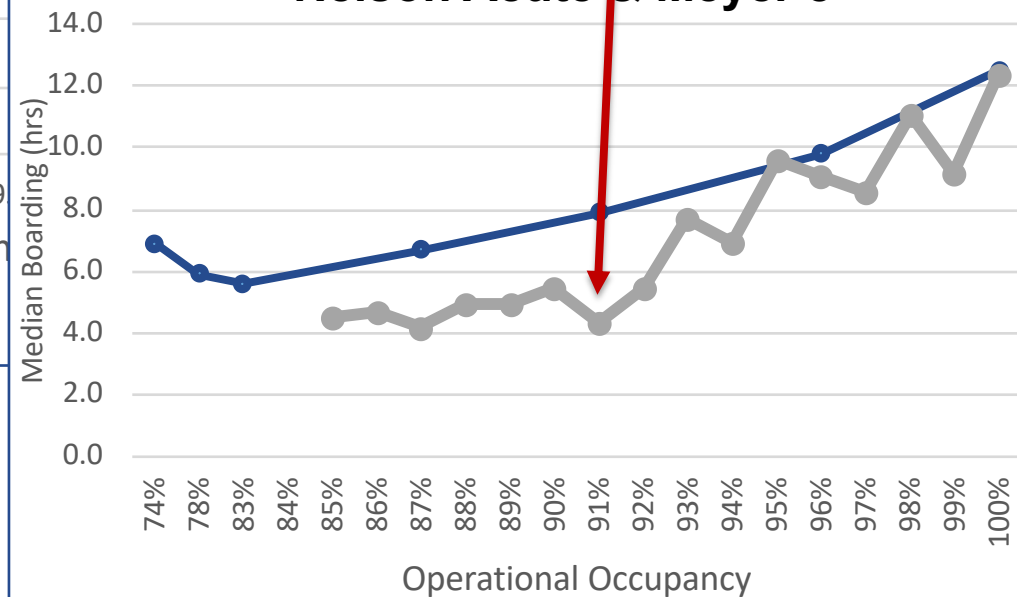
Is this Queuing Curve Real??

**Boarding vs Occupancy
Nelson Acute & Meyer 8**

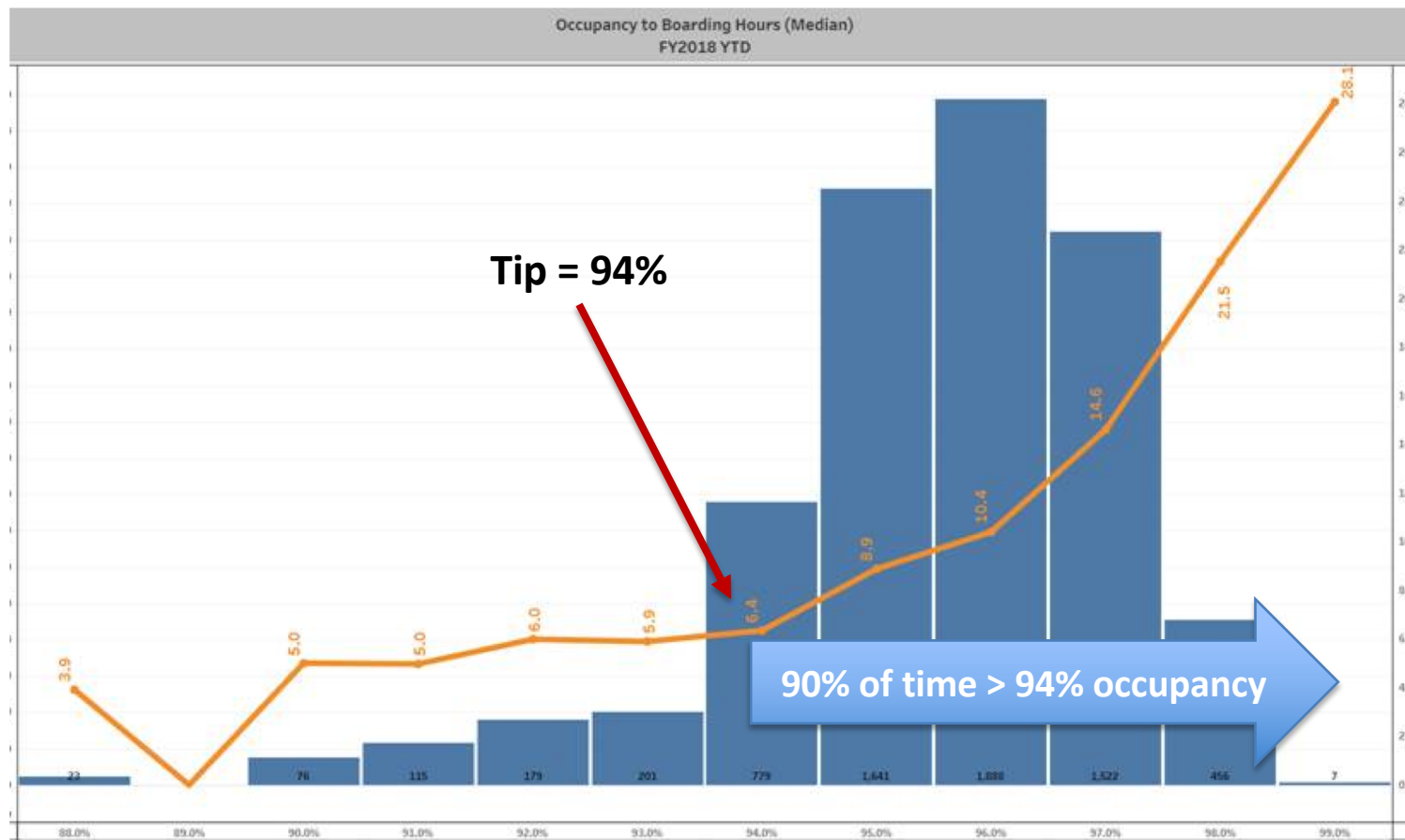


Tip = 91%

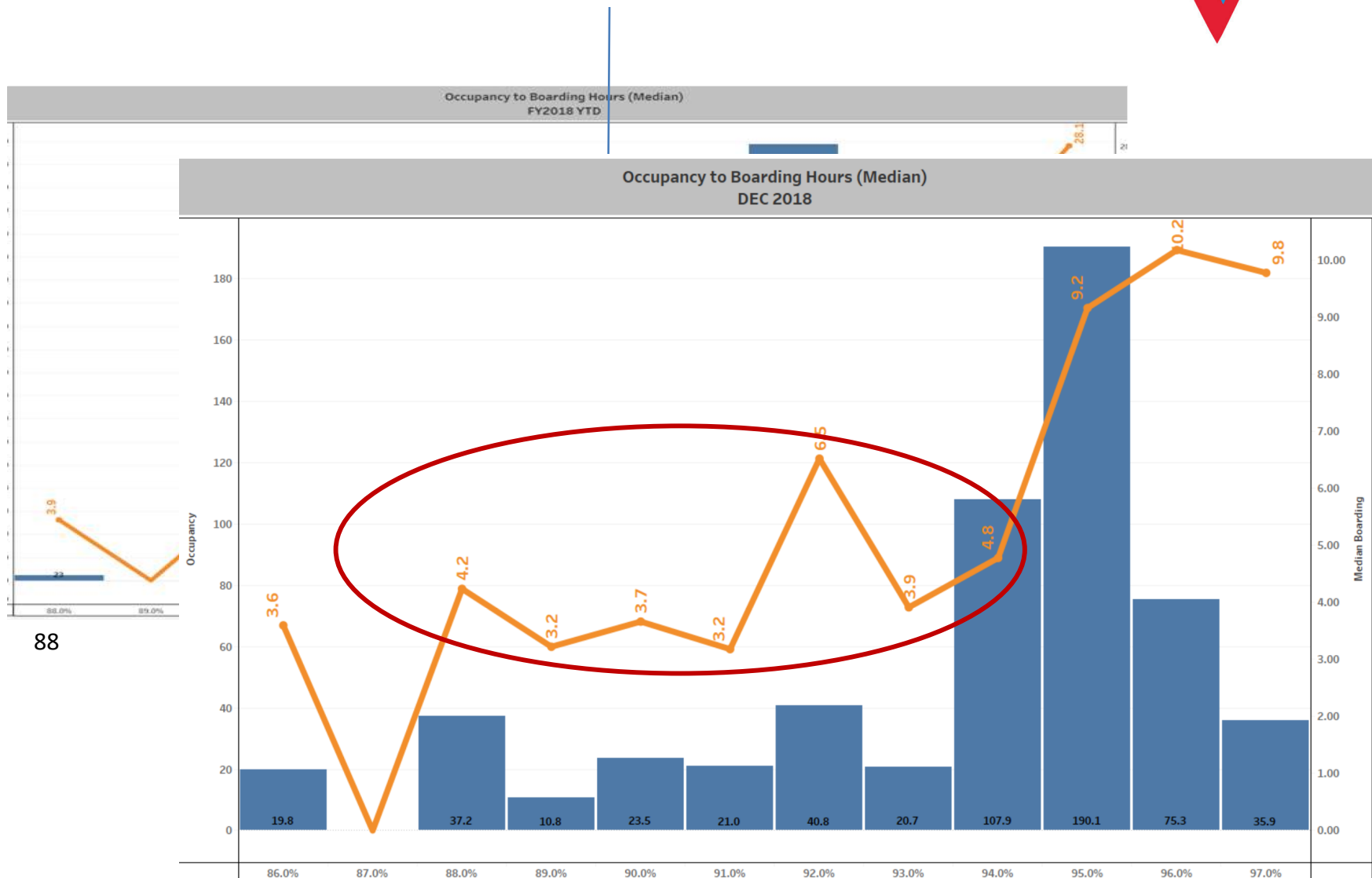
**Boarding vs Occupancy
Nelson Acute & Meyer 8**



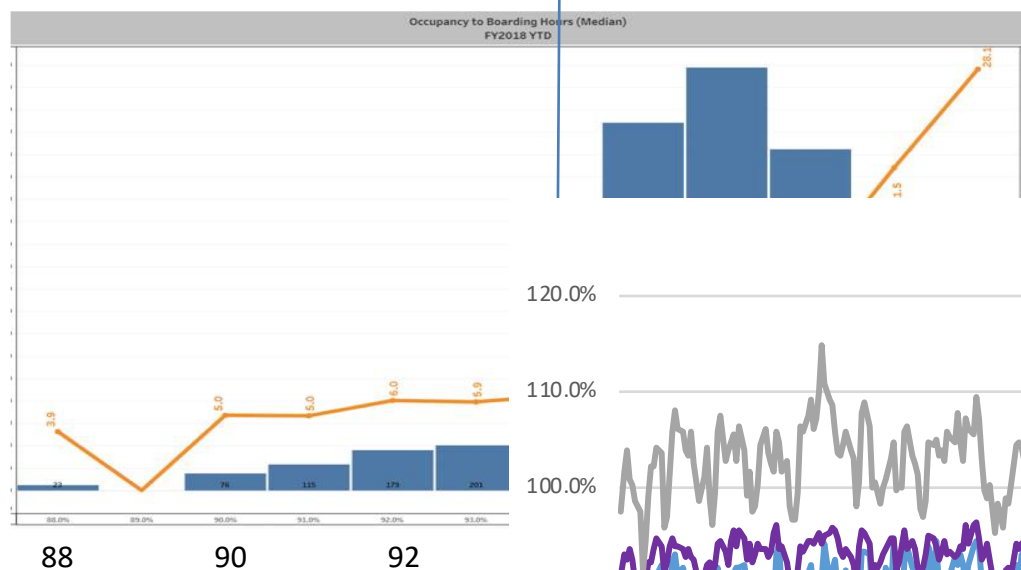
A natural consequence of Inpatient Occupancy



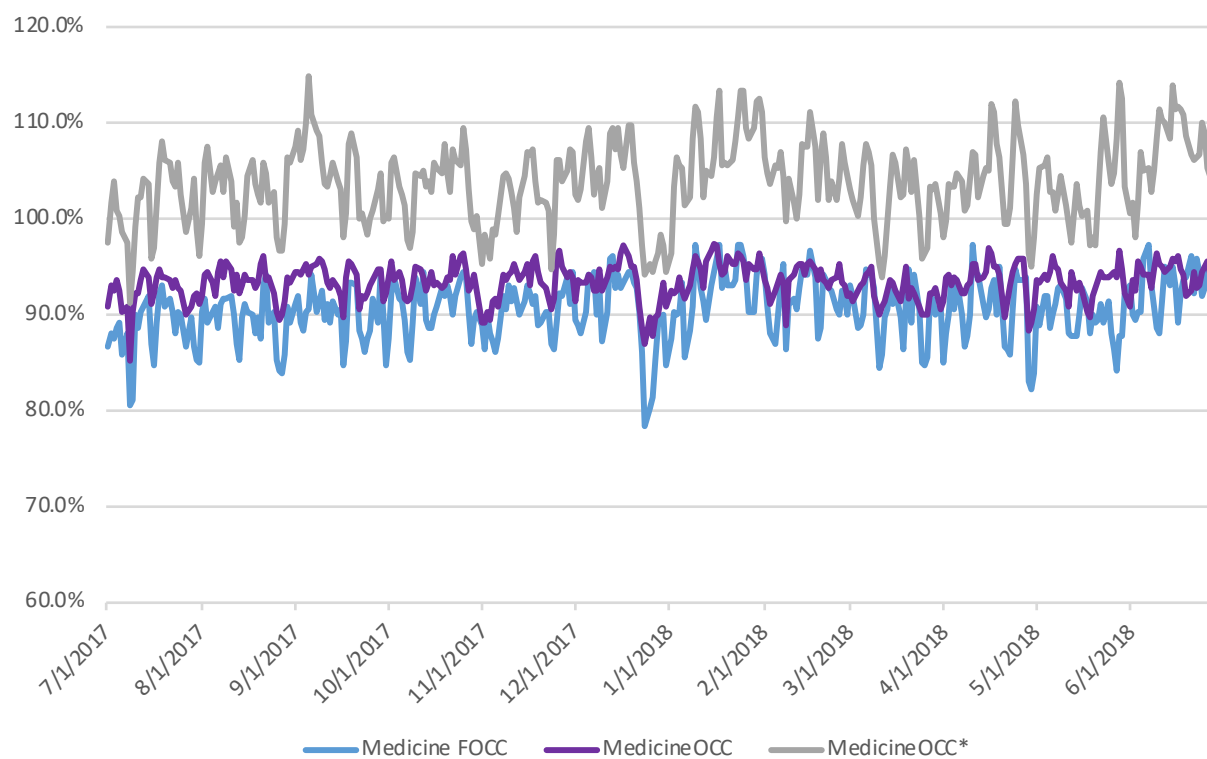
A natural consequence of Inpatient Occupancy



Inpatient Occupancy

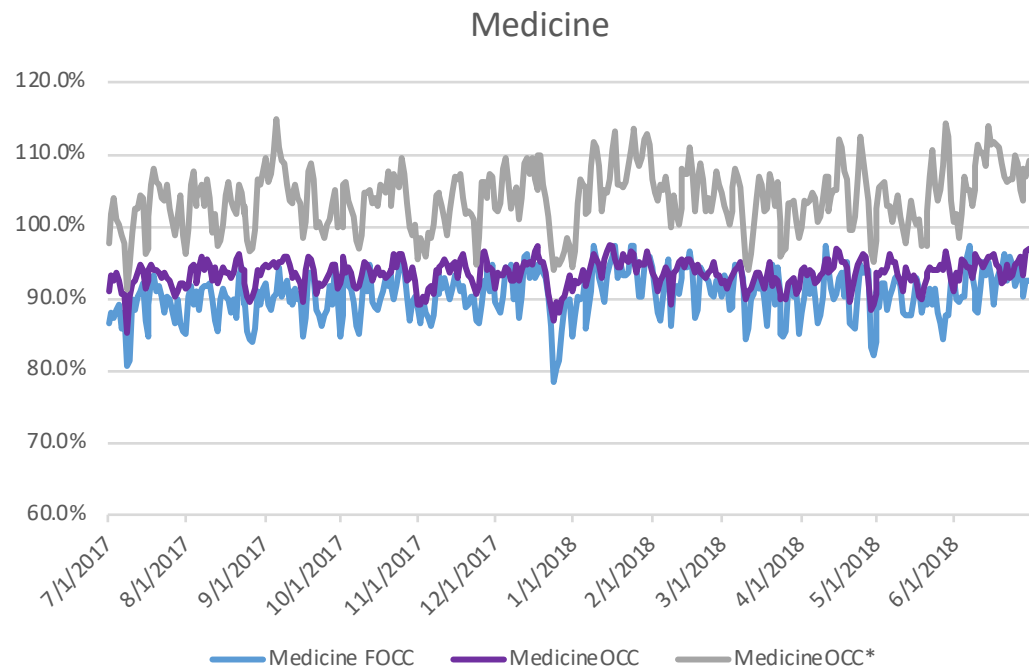


Medicine

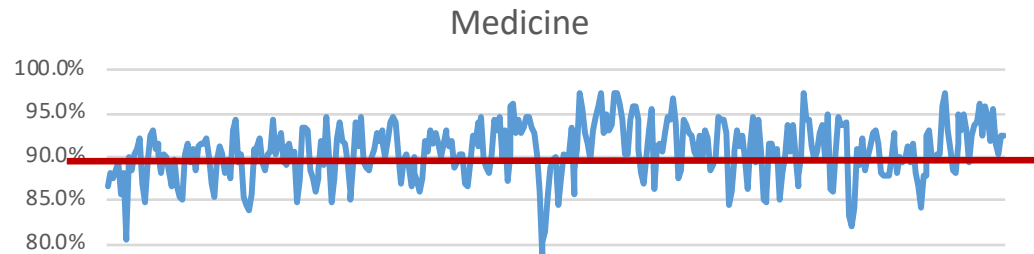


Inpatient Occupancy

- **Midnight occupancy is not a good measure of activity**
- **“Whole house” occupancy is not a meaningful measure for operations**
- **Inpatient operations are driven by the same 3 variables as the ED:**
 - # patients
 - # beds
 - Time = Length of Stay

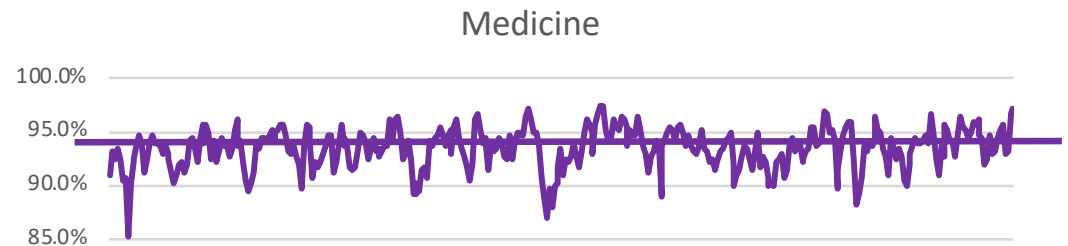


Inpatient Occupancy



Midnight occupancy = All licensed beds status at midnight

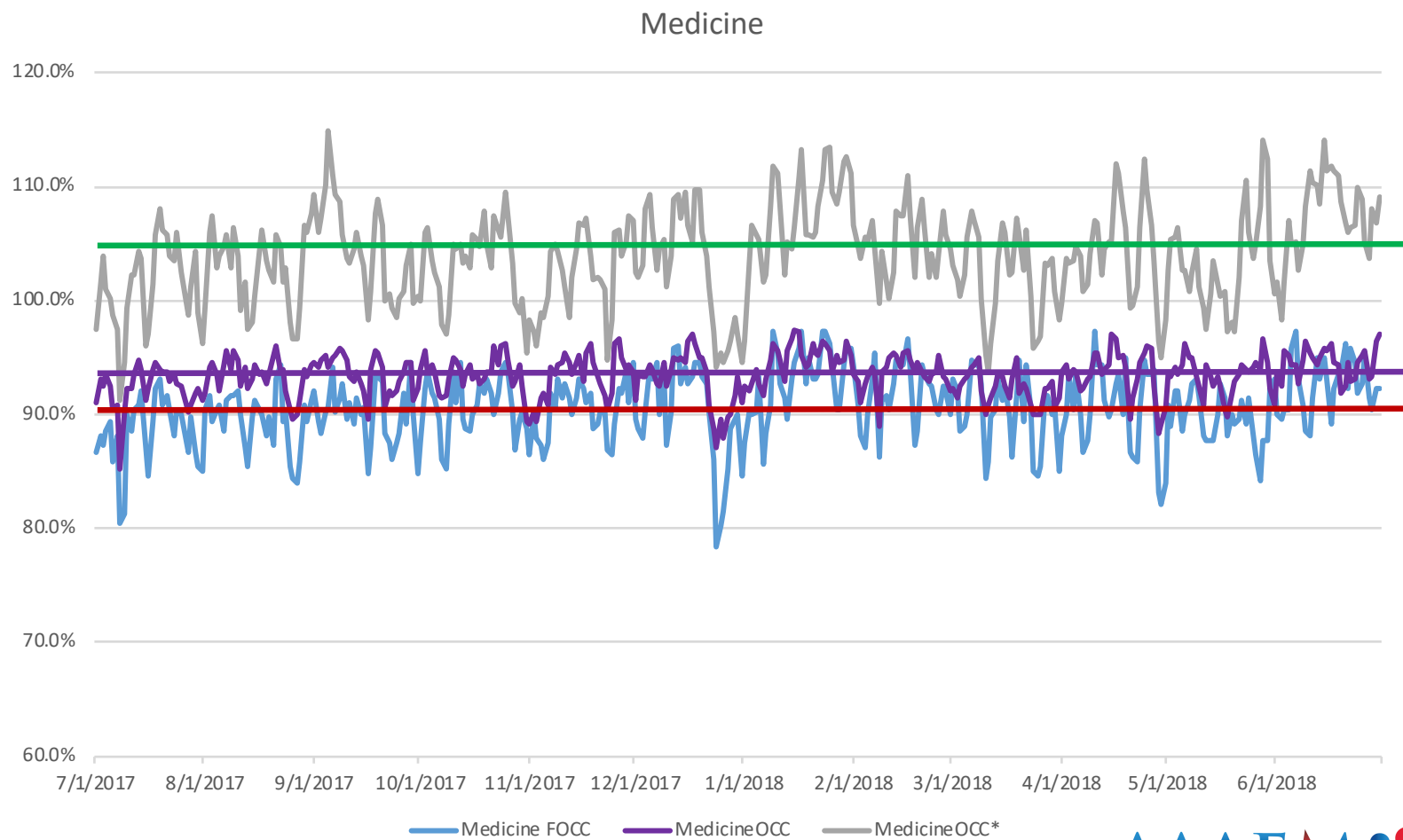
- Substantial variability around a mean of 90%



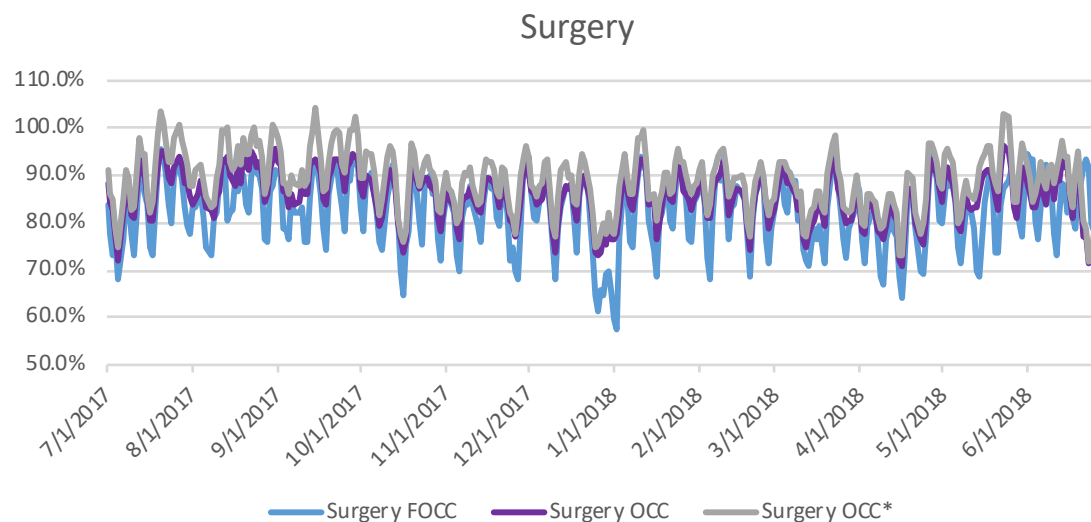
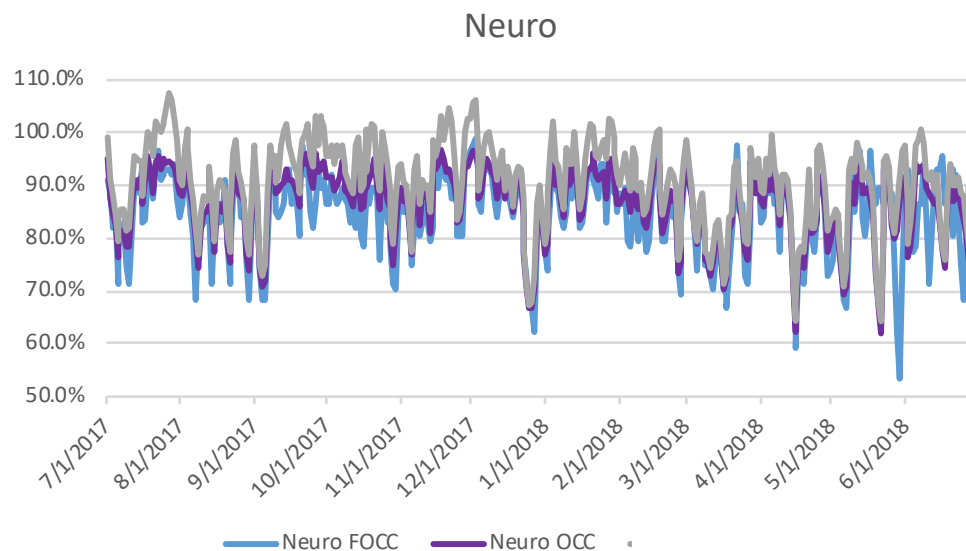
***Operational occupancy* = Open/Staffed beds in real time**

- Minimum variability around a mean of 94%
- Beds are full all the time....

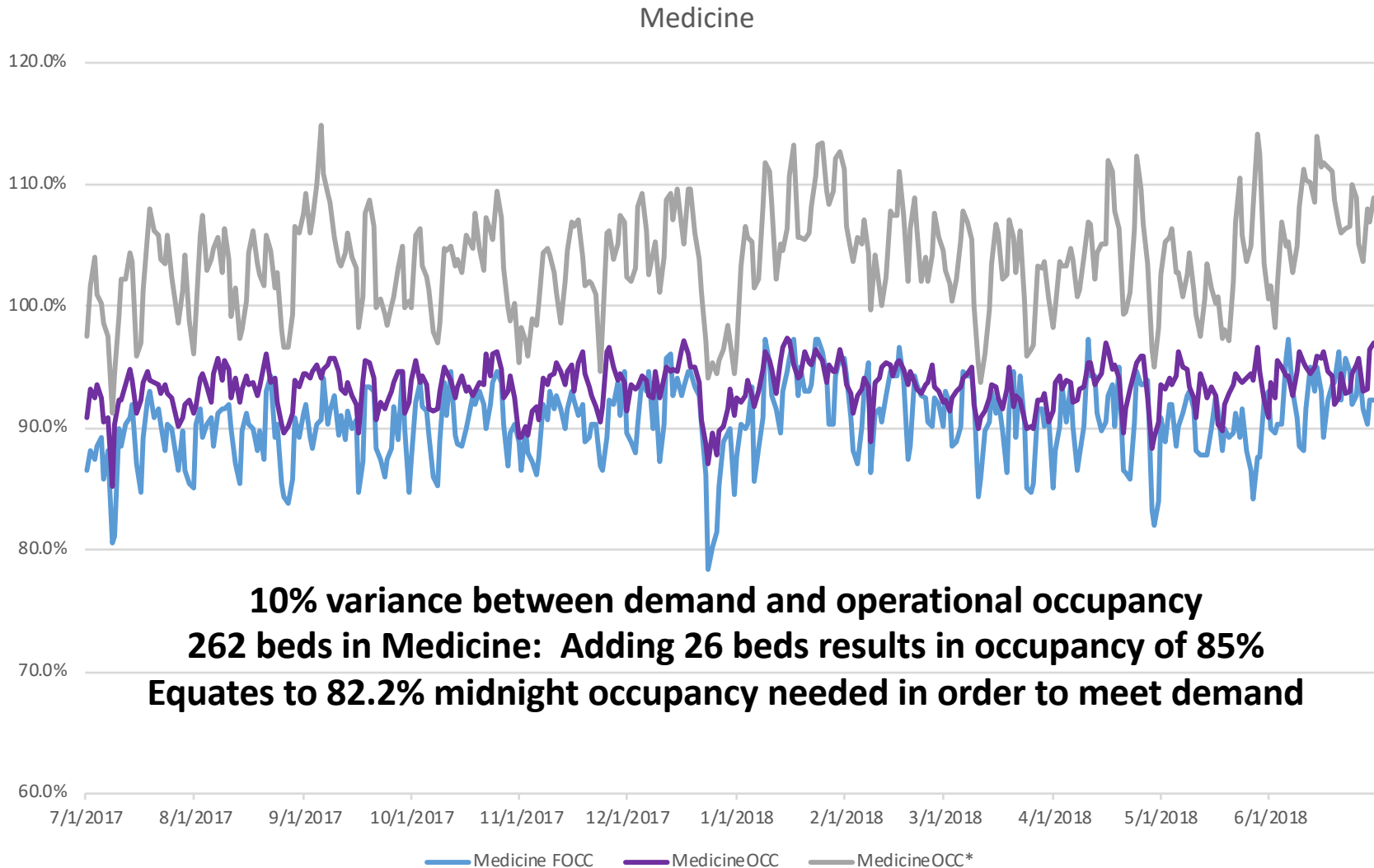
Inpatient Occupancy



Inpatient Occupancy



Inpatient Occupancy



Boarding, Crowding, Occupancy

- Boarding is a key operational issue for most hospitals and emergency departments
- Boarding is a consequence of inpatient occupancy
- Inpatient occupancy is best measured by service and in real time
- Policies that have led to the reduction of “excess hospital capacity” have led to excessively high inpatient occupancy