

OCCUPANCY



JOHNS HOPKINS CAPACITY COMMAND CENTER

Anna Ye, Administrative Resident

Advisors: James Scheulen, Chief Administrative Officer of Emergency Medicine and Capacity Management; Mary Margaret Jacobs, Director of Nursing for Capacity Management

BACKGROUND

The Judy Reitz Capacity Command Center is the first-of-its-kind, state-of-the-art hospital control center located in the heart of Johns Hopkins Hospital (JHH). Designed and built with the help of GE Healthcare Partners nearly three years ago, the command center combines collocated staff with the cutting-edge technology of systems engineering, predictive analytics, simulations, machine-learning and innovative problem-solving to optimize patient safety, experience, volume, and the movement of patients in and out of the hospital.¹

Occupancy is a crucial metric we track in order to understand how “busy” or operationally stressed JHH is. Understanding occupancy helps us manage capacity by anticipating the need within the hospital, allowing us to match our supply and demand. This ultimately gives us the opportunity to provide the appropriate resources to our patients to ensure quality and safety in clinical care.

AIM

The aim of this project is to gain a greater understanding of the different occupancy metrics JHH uses: midnight occupancy (midnight OCC), operational occupancy (OCC), and operational occupancy* (OCC*). Midnight OCC is the census taken at midnight used for financial reporting and budgeting. OCC was developed by the command center to introduce a real-time measurement to represent the true demand at any given time during the day. OCC* takes operational occupancy a step further and reflects the high demand for beds on the units by also considering inbound patients. With this analysis, we will examine the relationships between the metrics and will understand how to best apply the metrics to operations and planning to guarantee care quality and patient safety.

$$\text{Midnight OCC} = \frac{\text{census of inpatients at midnight}}{\text{open \& staffed beds}}$$

$$\text{OCC} = \frac{\text{heads in beds}}{\text{open \& staffed beds}}$$

$$\text{OCC}^* = \frac{\text{heads in beds + inbound patients}^*}{\text{open \& staffed beds}}$$

* includes transfers from other hospitals, emergency department boarding, and scheduled admissions

METHODS

This analysis will focus on the three largest departments at JHH (medicine, neurosciences, surgery) as they make up 70% of the beds in the hospital. Looking at FY 18 (July 2018 – June 2019); the GE Wall of Analytics allows us to collect data every 3 minutes regarding OCC and OCC*. In order to account for outliers, we opted to use the average for each day. It was critical to analyze the data daily so that we could compare these metrics to the midnight OCC, which is a snapshot of OCC at midnight.

CONCLUSIONS

SERVICE	MEASURE	MIDNIGHT OCC	OCC	OCC*
MEDICINE	MEAN	90.6%	93.4%	103.8%
	SD	0.0318	0.0186	0.0431
NEURO	MEAN	84.9%	86.7%	90.4%
	SD	0.0759	0.0681	0.0818
SURGERY	MEAN	82.6%	85.8%	89.0%
	SD	0.0728	0.0522	0.0617

VARIANCE – UTILIZATION

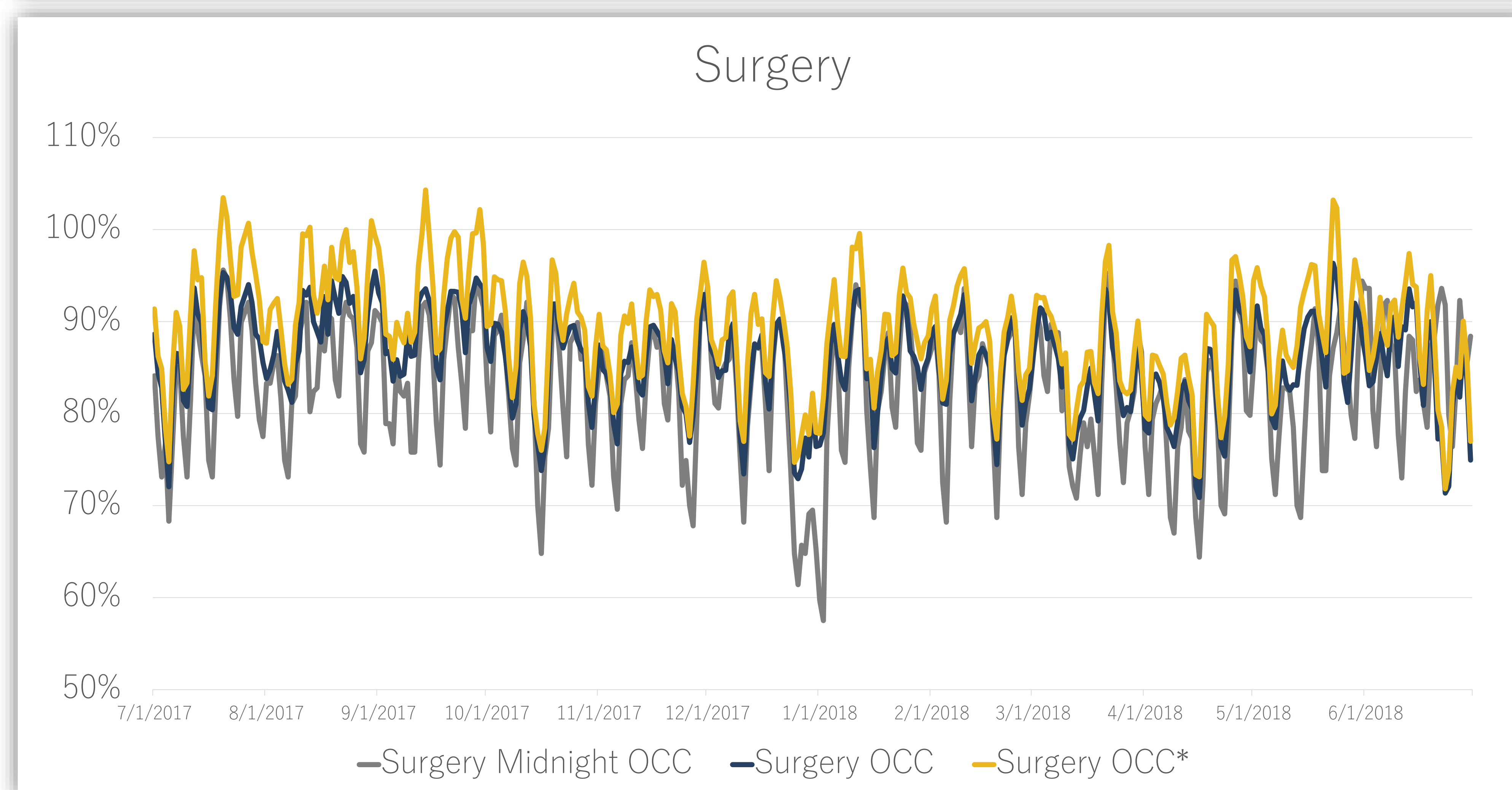
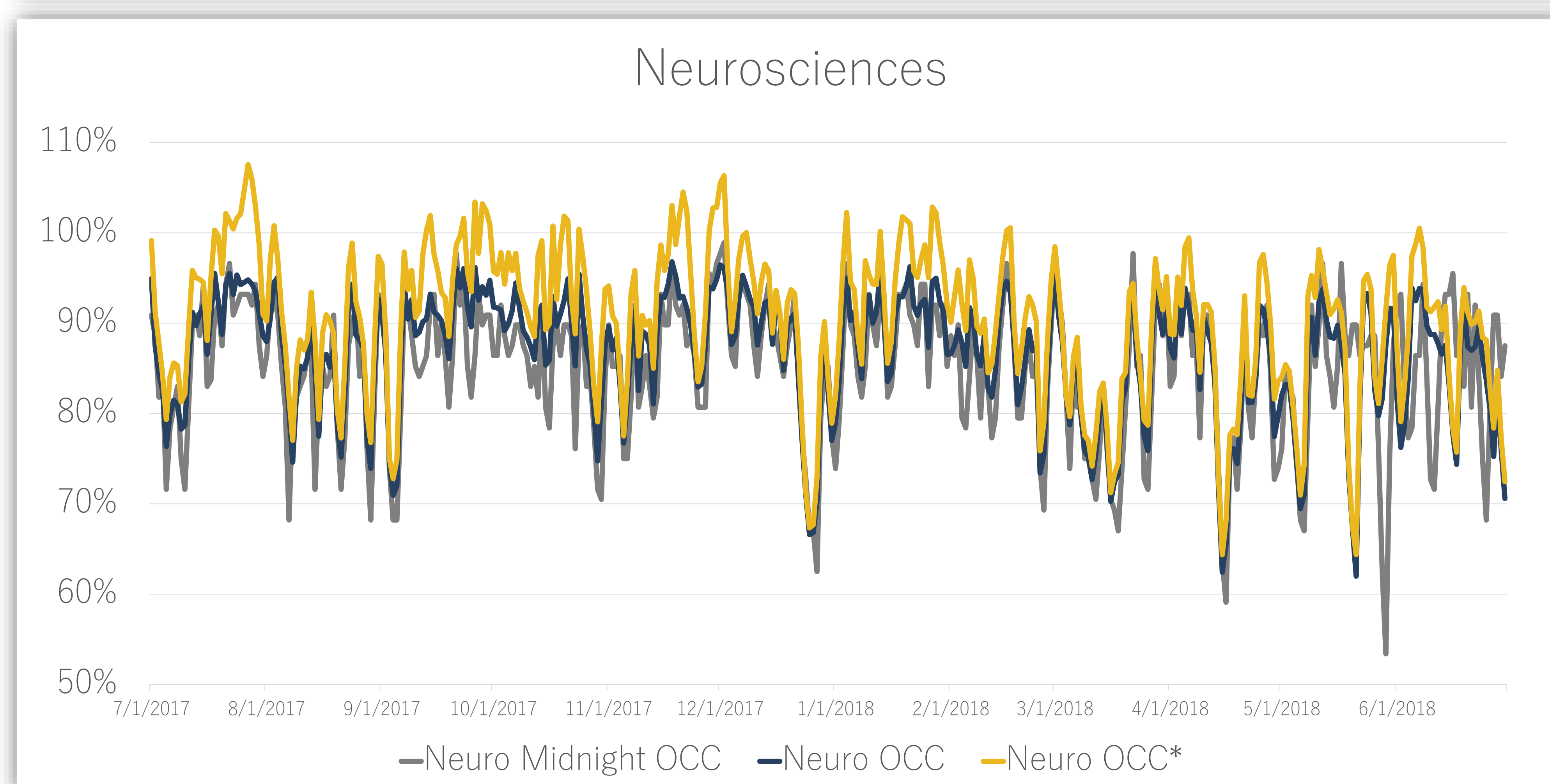
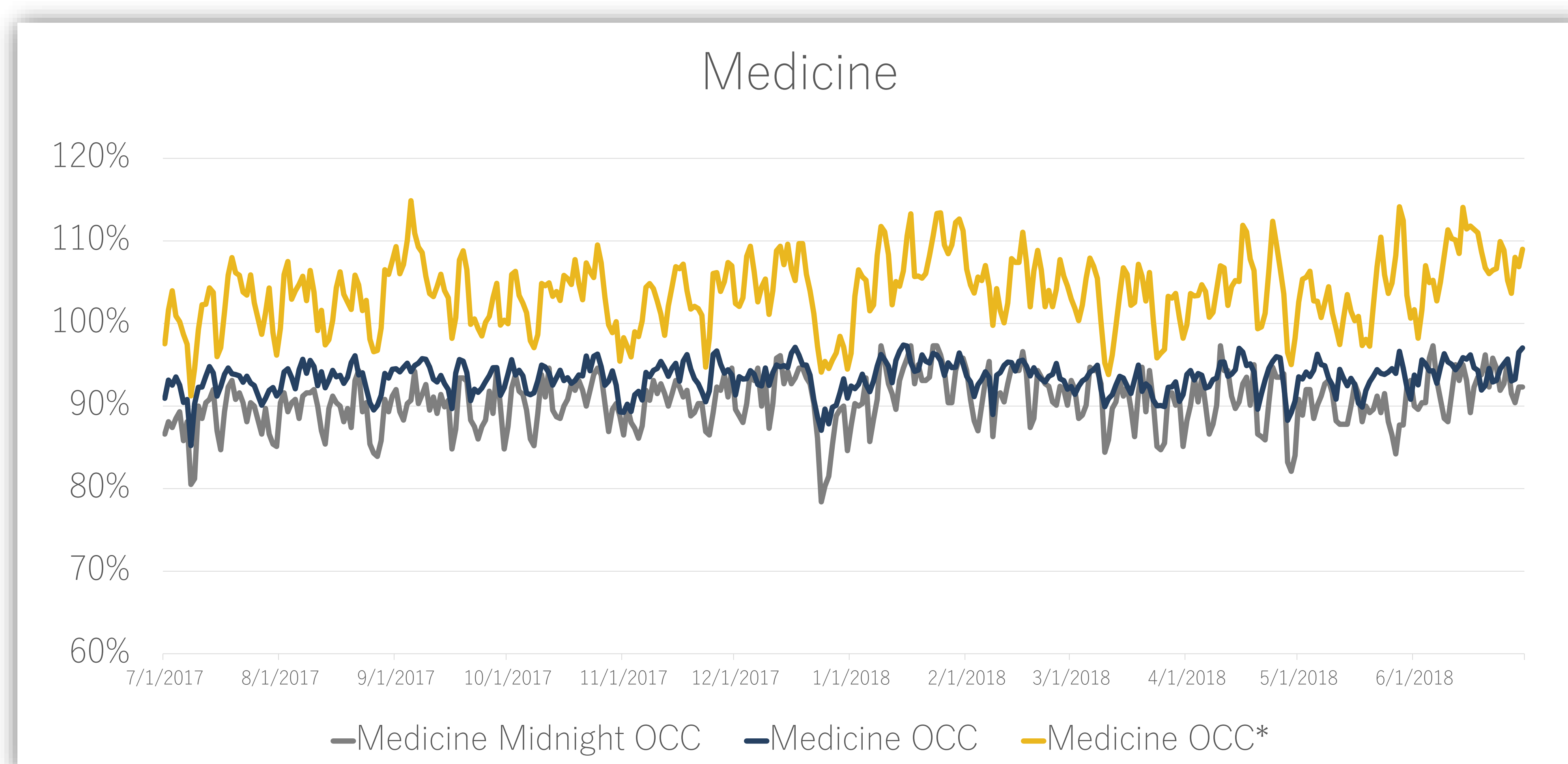
The variance (standard deviation) around the mean demonstrated in these graphs is an indication of the utilization of the inpatient beds. The minimal variance in use of the beds in the medicine service line, suggests that medicine beds are more consistently occupied during the course of a day, or week, as compared to beds in the departments of neurosciences and surgery.

MEAN DELTA – OPTIMIZATION

Noticing the 10.4% difference between OCC* and OCC for medicine, we investigated what would happen to OCC by adding 26 more beds (10.4% more) to the 250 bed service operating at the mean occupancy of 93.4%. This would result in a new OCC of 85% - the equilibrium for supply to meet demand, assuming the demand for our beds remains constant. 85% is consequently the “ideal” occupancy rate that many hospital executives aim for to manage patient flow.²

$$\text{NEW OCC} = \frac{93.4\% * 250 \text{ beds}}{250 \text{ beds} + (10.4\% * 250 \text{ beds})} = 85\%$$

RESULTS



LESSONS LEARNED

This project allowed us to gain insight into the occupancy metrics JHH uses on a regular basis to determine the daily capacity and resource planning operations of our hospital. This is clinically relevant as high occupancy directly impacts our quality and safety outcomes. We learned how utilization and optimization of our beds could be established through the variance and mean of occupancy respectfully. This project also confirmed that when supply meets demand in our medicine department, the operational occupancy reflects 85%, the “ideal” occupancy.

LIMITATIONS –

The relationship between midnight OCC and OCC/OCC* is difficult to define, therefore it is still unknown what occupancy should be reported financially to ensure occupancy is budgeted correctly. This is due to the challenge of representing the true demand since there is a lack of perfect comparisons. By comparing daily average occupancy to real-time occupancy rates, there is a limitation of flawed definitions of occupancy.

NEXT STEPS –

This investigation is the start of understanding how we can bridge the gap of 10.4% between OCC and OCC* for medicine without adding additional beds since adding beds is not feasible for JHH. In order to do this, we must first standardize across the industry how we define and calculate occupancy and will also need to consider further what the true “optimal” occupancy is through queuing curve analysis.³

REFERENCES

1. Johns Hopkins Medicine (2016). The Johns Hopkins Hospital Launches Capacity Command Center to Enhance Hospital Operations. Retrieved from https://www.hopkinsmedicine.org/news/media/releases/the_johns_hopkins_hospital_launches_capacity_command_center_to_enhance_hospital_operations
 2. Forero, R., McCarthy, S., & Hillman, K. (2011). Access block and emergency department overcrowding. *Critical Care*, 15(2), 216. <http://doi.org/10.1186/cc9998>
 3. Bain, C., Taylor, P., McDonnell, G., & Georgiou, A. (2010). Myths of ideal hospital occupancy. *Med J Aust* 2010, 192 (1): 42-43.