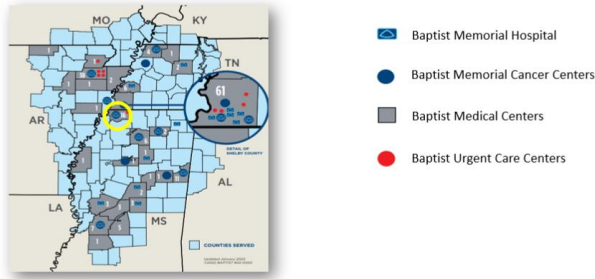


Baptist Memorial Hospital - DeSoto

Baptist Memorial Health Care Corporation (BMHCC) is a network of hospitals in the greater Memphis area that started in 1912 with a single 150-bed facility. It has since grown to over 30 locations with over 600 of the area's leading doctors. Our focus is on the 339-bed hospital located in Southaven, Mississippi nicknamed the DeSoto Hospital. BMHCC is concerned with their current restocking process with their automated medication dispensation system, Omnicell Cabinets.



Understanding Demand Rate

To begin understanding the demand rate of the medications we began by summing all the completed medication requests as well as the medication request that could not be filled. Using this new number, we divided it by the number of days in the month that this demand took place to create a daily demand rate. With this daily demand rate specified for each medication we could compare it to the current par of that medication.

EXAMPLE

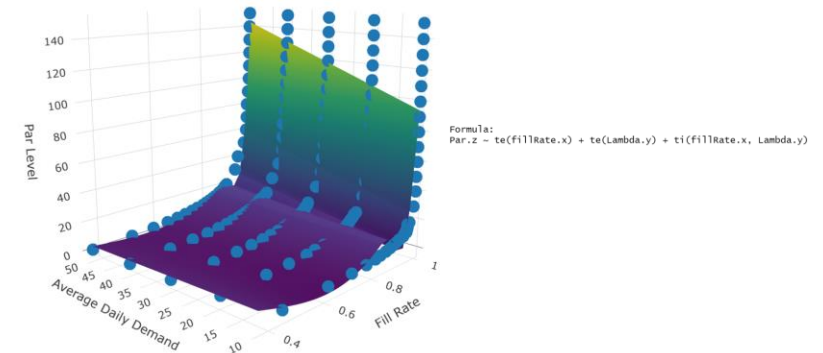
January Data		
Omnicell	Used	Stockouts
A	40	3
B	36	4
C	21	1
Total:	97	8

$$\frac{\text{total monthly demand for med. } i}{\text{total number of days in given usage report month}} = \frac{97 \text{ qty used} + 8 \text{ stockouts}}{31 \text{ days}}$$

$$\lambda \approx 4 \text{ units per day}$$

Fitting a Model to Simulation Output

From our data outputted by the Process Analyzer feature in Arena, we were able to fit a 3D model to generalize medications based on the data from the simulation. To fit this model to an equation, a General Additive Model is used using a tensor smoothing product for fill rate and average daily demand is used. The products are added together and a tensor interaction is produced leaving the prescribed par level.



Omnicell Dispensing Analysis

The Omnicell dispensing cabinets hold and dispense medication to nurses to then administer to patients as needed. Omnicells have different inventory levels within them: par, restock level, critical low, and stock out. To figure out what part of the restocking of Omnicell's was causing issues we began breaking down the daily restock plan and the dispensation data into their most basic time slots. From this we were able to determine that the Omnicell's were stocking out of their medications ~22 times a day.

64 Omnicell Cabinets

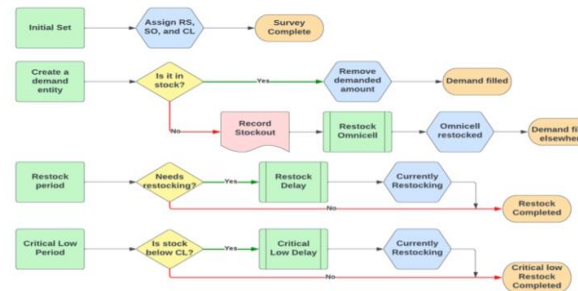
- 591,195 Dispenses
- 810 Medications
- 2,708 Stockouts
- 13,353 Critical Lows

22 Stock-outs per day



Simulating an Omnicell

By Simulating an Omnicell in Arena, we were able to simulate a once hundreds of different combinations of daily demand versus par level to analyze how many times a singular medication would stock out. Our simulation also considers 'wasted minutes'. This records how much time in minutes nurses could be potentially wasting when an Omnicell is stocked out.



Prescribing Par Levels to Reduce Stock-outs

After finding an equation to allow for fill rate and lambda to be taken in and transformed using tensor products, RStudio code was developed to take in automatically generated usage reports and provide prescribed par levels. Instructions on how to manipulate the code for user input were written up in a deliverable and provided to BMHCC.

Omicell ID	Rx Display	Avg Demand	Prescribed Par
DHE3	Aspirin 81MG ...	8.76	18
DHCL2	Lidocaine HCL ...	8.71	11
DH4S	Calcium Acetate ...	7	10
DH8T	Hydromorphone ...	6.29	9