1. Presentation Title – Optimization of Automated Dispensing Cabinets with Package Conscious Replenishment
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4. Background Information
   * Automated dispensing cabinets (ADCs) are ubiquitous in the modern health system due to their ability to provide reliable access to medications closer to the patient. While these machines significantly contribute to efficient medication distribution, they pose equally significant logistical challenges to maintain. With upwards of 300 inventory locations, or pockets, per device, large academic medical centers like the UNC Medical Center (UNCMC) with hundreds of devices can have tens of thousands of inventory locations to keep reliably stocked. Traditionally, efforts at optimizing this process have focused on adjusting the periodic automatic replenishment (PAR) levels of ADCs. However, a significant amount of pharmacist and pharmacy technician hours are spent on the process of pulling medications to be loaded into the ADCs and there has been a paucity of research on optimizing this process.

UNCMC utilizes an offsite location operated by its parent system, UNC Health, called the Shared Services Center (SSC) to replenish its ADCs on a daily basis. Currently, SSC pulls medications to restore cabinets to the maximum PAR levels set by UNCMC, to the exact quantity. This operation results in inefficiencies from pulling odd quantities that take additional technician time. Rounding medication pull quantities has been suggested as a way to reduce the time needed to complete the UNCMC replenishment. Decreasing this time would allow SSC to potentially re-allocate staff or bring on additional hospitals within UNC Health as customers.

1. Objective
   * Aim 1 : Create a model capable of simulating stock-out frequencies for different replenishment models
   * Aim 2: Model the impact of package-conscious replenishment on stock-out frequency within the ADCs
   * Aim 3: Estimate the time and financial impact of increased efficiency afforded by package-conscious replenishment
2. Methods
   * In order to adequately forecast the impact of PCR, we must first create a model to simulate different replenishment strategies. This model will allow us to input real-life use data for the inventory items across a number of ADCs, set our PARs, and then simulate inventory over a period of time. This will allow us to predict the frequency of stock-outs and impact on carrying cost of PCR over a number of machines. A simulation was chosen over directly implementing PCR due to the significant cost and time savings as well as the lack of established efficacy for PCR.

One the model is constructed, we will utilize it to forecast the impact of PCR on stock-out frequency. Essentially, we will simulate switching our replenishment strategy over to PCR and then run the model for a number of months of real-world transaction data to assess what, if any, impact is had on stock-out frequency. The outcome of this aim will be comparable stock-out frequencies for the two different replenishment strategies. Answering the question about stock-out frequency will be one piece of the justification for implementing PCR. If we are able to demonstrate that PCR improves, or at least doesn’t worsen, stock-out frequency, then the potential financial benefits will be better received.

The third and final aim of this study will be to estimate the time and financial impact of increased efficiency afforded by PCR. PCR is expected to decrease the time needed to pull medications for replenishment because it reduces, and in some cases eliminates, the need to break packages. As this is the main anticipated benefit of PCR, it is crucial that this study accurately quantifies this time saving. Additionally, since implementing PCR will involve changes to the average stock held in the ADCs, it is important to quantify the financial impact in the form of the inventory carrying cost. At its core, this aim seeks to assess if the time saved with PCR is significant and is worth the increased carrying cost.

1. Preliminary Results
   * N/A
2. Conclusion
   * N/A