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Efficiency Improvement within Supplies Inventory at a Critical Access Hospital

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Abstract

Critical Access Hospitals (CAH's) are small hospitals (25 beds or fewer), which meet specific criteria developed by the Centers for Medicare and Medicaid Services. They are often located in rural communities, which have a disproportionately high number of uninsured, underinsured and Medicare patients. As such, CAH's face significant challenges in meeting the growing demands of the current healthcare climate with limited resources. One such facility located in Baker, Montana had recently relocated the supplies inventory within the hospital and faced the problem of a time and cost efficient organization of the department. As part of a two-week rapid improvement event, the storage design was analyzed, and a visual representation created which depicted graphically the current travel, pick locations, and resulting wastes. The visualizations helped garner consensus as to the main areas of inefficiency, and helped determine alternatives in how to reorganize the department. The agreed upon design grouped items by hospital department and brought high frequency picked items to the front of the storage area, located in easy-to-reach shelf locations, with a designated and labeled location for each item. The implemented reorganization resulted in approximately 50% travel distance and 70% search time savings.

1. Introduction

A common problem that critical access hospitals face is access to resources to improve and have time to take control of any problems they encounter. The Fallon Medical Center located in Baker, Montana remodeled a section of their facility and relocated the purchasing and supplies department into this new area. With the available resources of 1.5 full-time equivalents, proper planning was limited and the overall project remained unfinished.

The Montana Office of Rural Health received a FLEX grant which was used to fund a Lean Healthcare Process Improvement program [1]. The application from Fallon Medical Center was one of the seven projects selected for industrial engineering assistance to perform a two-week rapid improvement project [2]. The student interns applied many Industrial Engineering tools as they followed an A3 problem-solving process [3] focused on creating a visual interface of the problem understanding, planning, and solution development in a way that the personnel involved with the project could easily understand. The benefits of these methods helped make the time available for the project more efficient and brought a new method to help employees of the hospital understand and tackle the root causes of problems [4].

This medical center consists of a nursing home, a long-term care unit, and a hospital. All of these are connected under one building. The purchasing department keeps supplies for the entire facility with the exception of prescribed medication. The purchasing department is not only in charge of keeping stock for the medical center but also replenishes the whole building three days a week. The department had just relocated to a new location within the building and wanted help for the redesign of their new location.

2. Current Condition

When the department moved to the new location, organization of the inventory was lacking as supplies were moved and placed on shelves with little planning due to the limited staff time availability. To understand how the inventory was organized the current condition had to be completely understood. Data recorded on the items in inventory consisted of a hospital department usage category and current purchasing department storage location. These categories and locations can be seen in Table 1. Once these categories and locations were identified for all the items, historic files were pulled from the inventory management system to see how often each inventory item was used.

Creating a detail floor layout drawing and interpreting the historical usage data, the frequency of high, medium and low picked items were marked on the drawing. This method, seen in Figure 1, created clear and fast communication with client in understanding current situation of the inventory organization in their department. This technique shows what items were the most frequently used. Once all the data were compiled, a current inventory layout was created, as shown in Figure 1. This diagram depicts the layout of the floor along with the usage categorization of the items stored.

After observation of the employees, it was determined that a reorder point system was used to see what items needed restocked throughout the hospital. After a pick list was created, employees traveled back to the purchasing department to pick the items from central inventory. The location of each picked and travel route taken was tracked and marked on the floor layout drawing, as shown in Figure 2. From detailed floor layout, employee travel distances could be approximated. Table 2 displays the travel distance results. The next step to understand the current state was to understand the replenishing system. For the replenishing system the worker would receive a note from the various departments indicating which items were needed and in what quantities. Once replenishment requests were received from all departments, the worker would go through the purchasing department with a shopping cart picking the needed items. A flow chart for this process was created, as shown in Figure 2. The total distance the worker traveled can be seen in Table 2.

Table 1: Category of item types stored on each shelf

Shelving Unit	**Category of Product**
A	Urology Respiratory General Supply Suction-Stomach
B	Wound Care
C	Wound Care
D	Compression Stocking Surgery
E	Miscellaneous Endoscope
F	Casting
G	Tubing-Stomach Surgery
H	Hygiene Cups
I	Wound Care Urology Circulatory
J	IV Central Supply Hospital
K	OTC

Shelving Unit	**Category of Product**
L	IV Respiratory
M	Respiratory
N	Surgery Respiratory Stomach Urology Emergency Kit
O	Gloves
P	Immobilizers
Q	Immobilizers
R	Immobilizers
S	Custodial Supplies
T	Custodial Supplies
U	Miscellaneous Office Supplies
V	Printing Supplies
W	Labels and Folders
X	Envelopes
Y	Paper
Z	Hospital Forms
AA	Adult Brief Liners and Accessories
AB	Candy

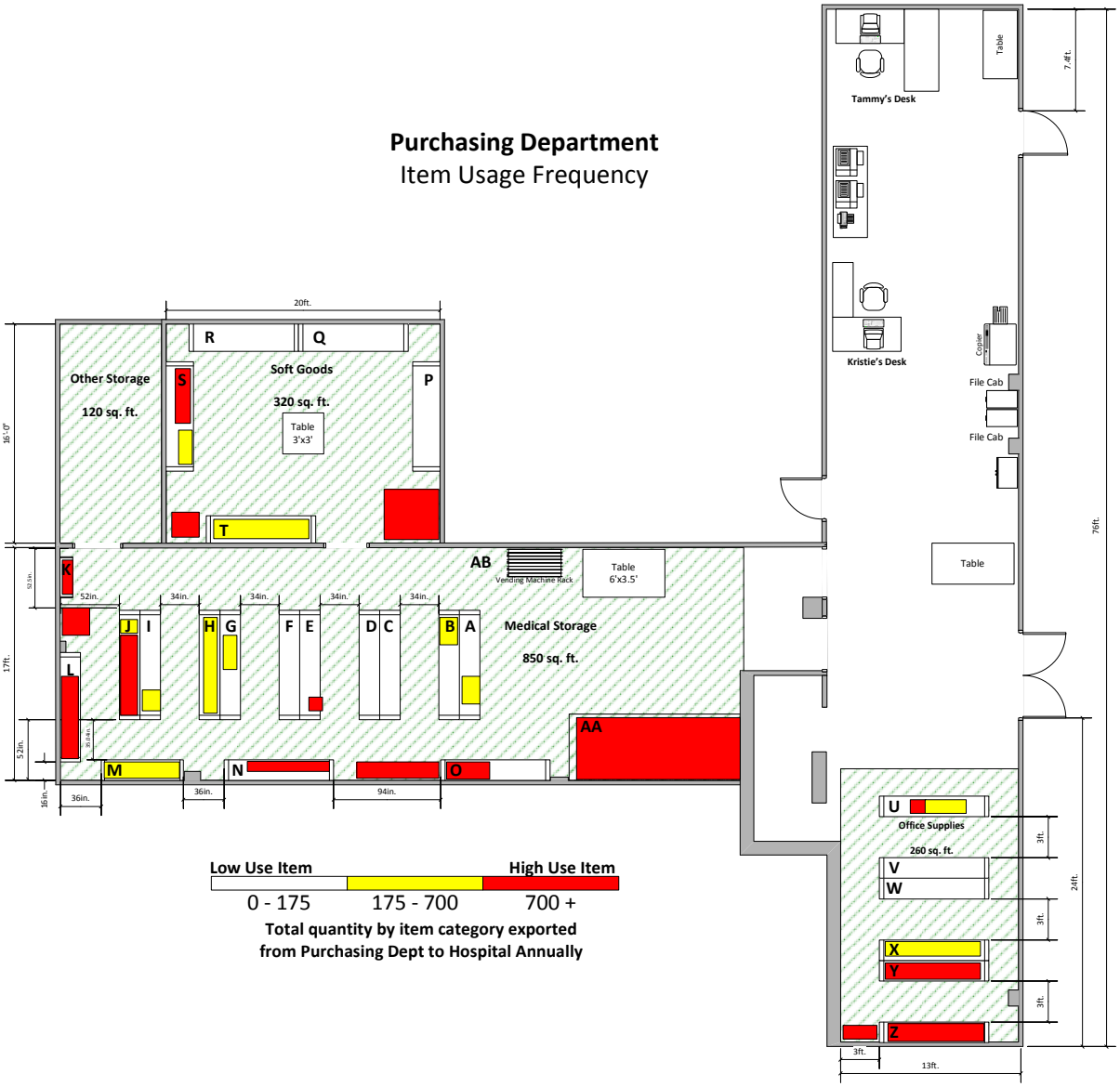

Figure 1: Purchasing Department floor map displaying current locations of item usage

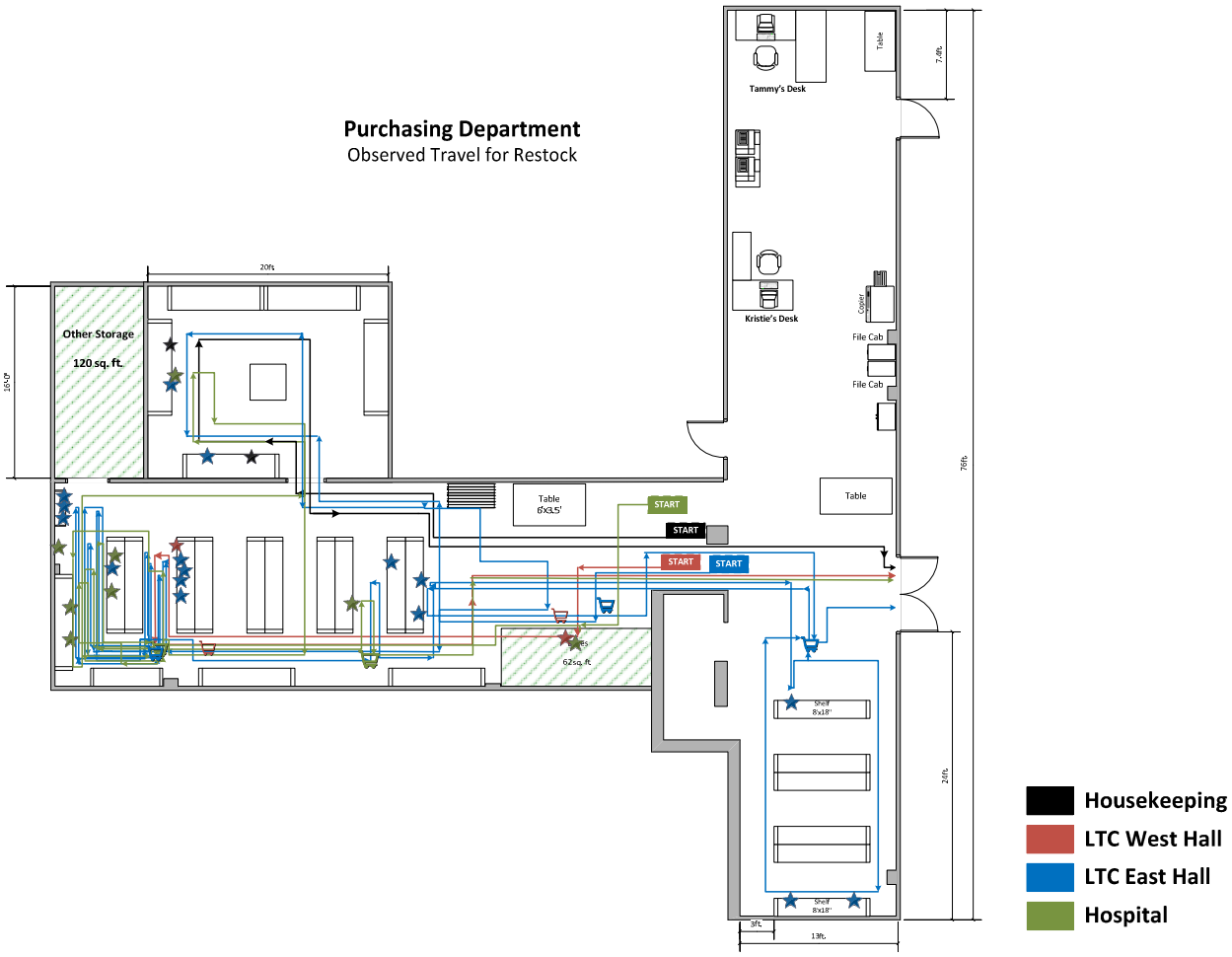

Figure 2: Layout displaying travel and pick location

Table 2: Travel distances of item picking categorized by departments in facility

Observed travel distance of Purchasing Department Employees	
Department	**Distance (ft)**
Housekeeping	148
LTC West Hall	136
LTC East Hall	427
Hospital	312

By looking at the two figures above one can see a couple problems with the current layout. The first problem, seen in Figure 1, visually indicates that a lot of the highly used inventory is located at the back of the department. This can create waste due to excess travel distances. Comparing that with Figure 2, more evidence is provided that employees pick a high proportion of the items in the back of the department. Also Figure 2 depicts the employee leaving their cart at the end of an aisle creating redundant travel to nearby pick locations. This brought up the question of why the cart is being left at the end of the aisle. After further investigation, the cause of the issue was that the cart could not fit down all of the aisles. The last problem is with the lack of organization. Since there was no organization among the items, it was decided to test how long it would take to find six random items from the

inventory list with someone unfamiliar with the current layout. Six items were randomly pulled from the entire list of inventory. We then timed how long it would take this person to find all six items. The results from this test created a baseline against which to test any changes to the layout. The results can be seen in Table 3.

Table 3: Average Time for a Random Item

Search Time for 6 items using current inventory organization	
Time 1	9.35 min.
Time 2	7.02 min.
Time 3	9.15 min.
Average	**8.51 min.**

3. Goal

After all the data was collected, two improvement goals were established. The first goal was to reduce the average worker travel distance while replenishing the medical center. The other goal was to reduce the amount of time for any person that comes into the department to locate a random item of inventory.

4. Countermeasures

We developed a number of countermeasures to address the sources of inefficiency within the current medical supply inventory. The first countermeasure was to re-categorize the rows by department or by usage. The proposed categorization can be seen in Table 4. Next all the items in the high use categories were moved to the front of the department. The resulting layout can be seen in Figure 3. The new categories and new layout help improve the efficiency of the department for a couple reasons. First it makes sure that all relevant categories can be placed together. Also with the highly used categories placed at the front these items are more accessible to anyone who comes into the department.

The next countermeasure was to widen the aisles to allow the cart to pass easily down rows. The original layout did not allow the cart to pass through the aisles which caused the employee to have extra travel. The worker had to leave the cart at the end of the aisle, walk down the aisle to retrieve items, then walk back to the cart. Widening the aisles would enable the worker to travel down the aisle with the cart, eliminating the travel back to the cart.

The next action taken was to create a “grocery store” style labeling system in order to clearly indicate what categories of items are located in each aisle. Then a label was created for each storage location to indicate the item and size or quantity for more rapid identification. The layout for the proposed labeling system can be seen in Figure 4. In addition, each location was given a bin number and a database created indicating which items should be in which location. This provides the staff with a list that shows know exactly in what aisle and on what shelf every item is located.

A third countermeasure to go along with label system was creating a map of the department to show where categories of items are located. The item locator would enable any person to walk into the department and look at the map to see where the desired item would be located rather than wandering the aisles in search of the needed item. Once they have located this category on the map they can walk further into the department to find the category label outside of the aisle. Then they can walk down the aisle to find the item with its label on the shelf.

A final countermeasure was to organize the soft goods room according to body part. The soft goods room contains items for casts and braces. Categorization by body type allows staff to find all of the items relevant to the body part they were searching for in one location. The last countermeasure was to create a bin location for each item.

Table 4: Re-categorization of Inventory

Shelving Unit	Category of Product
A	LTC Supplies
B	IV Supplies
C	IV Supplies
D	Syringes
E	Respiratory
F	Wound Care
G	Wound Care
H	Urology
I	Stomach
J	General / Central Supply
K	OTC
L	General / Central Supply
M	ER
N	Clinic

Shelving Unit	Category of Product
O	Gloves
P	Paper Products
Q	Immobilizers/Casting
R	Immobilizers / Casting
S	Custodial Supplies
T	Custodial Supplies
U	Forms
V	Paper
W	Misc Office Supplies
X	Envelopes
Y	Printing Supplies
Z	Labels and Folders
AA	Adult Brief Liners and Accessories
AB	Candy

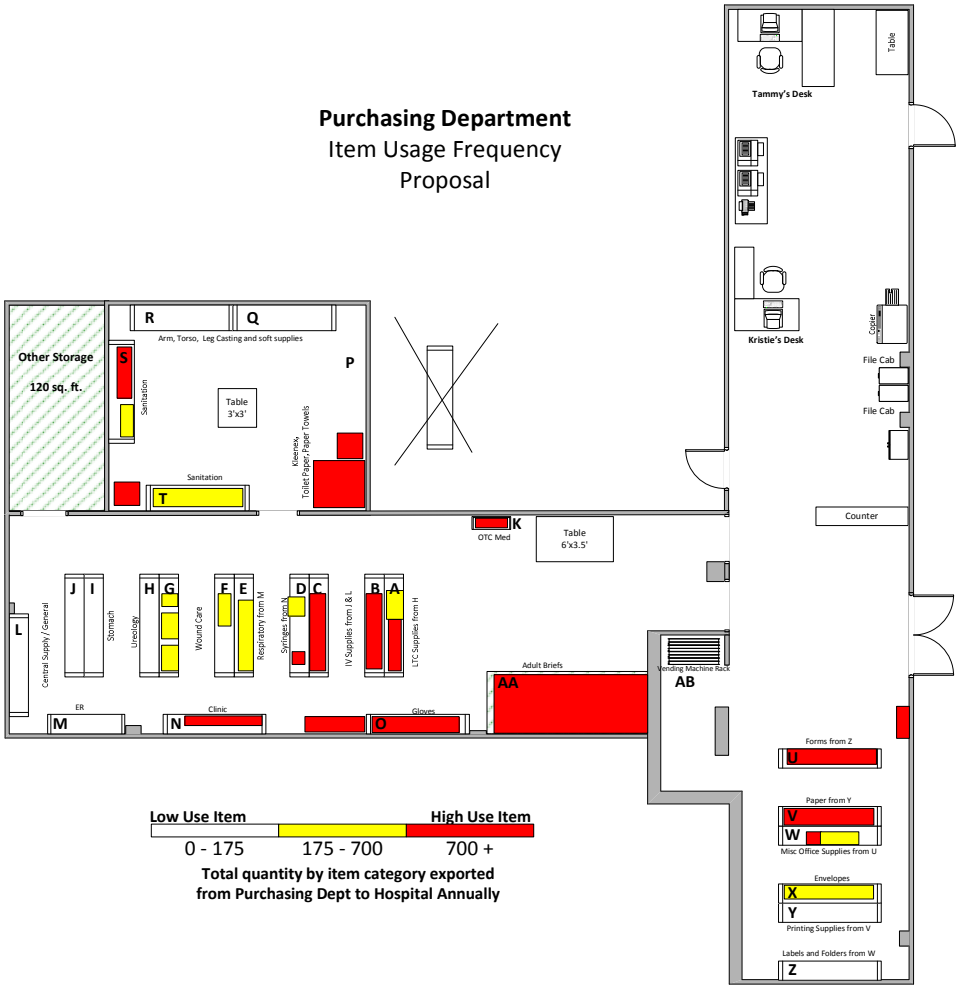

Figure 3: New Layout

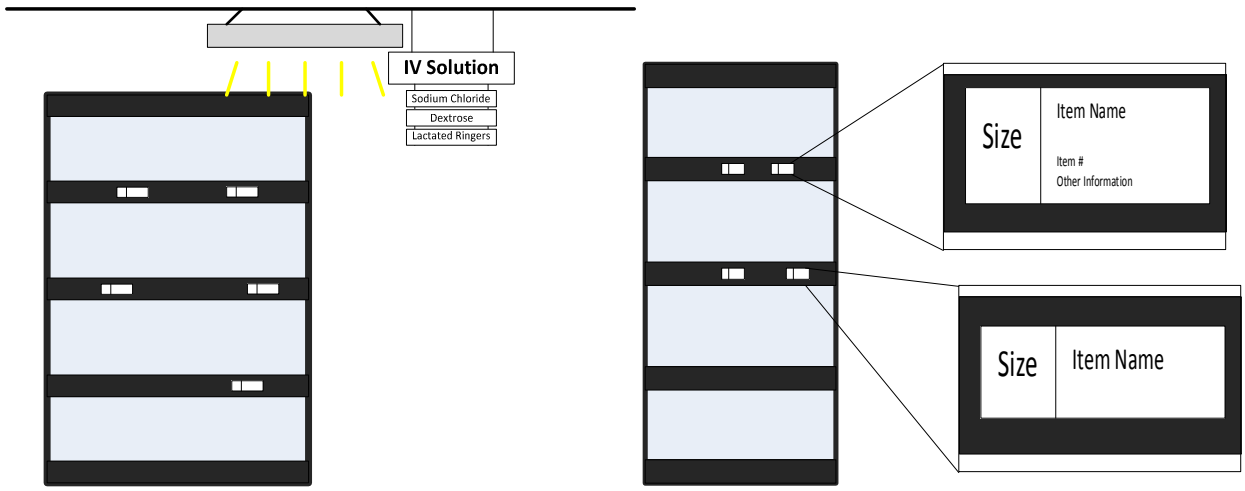

Figure 4: Grocery Store Labeling System

5. Results

After the countermeasures were implemented the same process of data collection was retested in order to validate that the changes created improvements to the system. The first piece of data collected was the workers distance traveled for the replenishing system. To do this, another flow map was created to track travel and mark pick locations. The results can be seen in Figure 5and Table 5. To create this flow chart we mapped the distance the worker traveled throughout the department as they pushed their cart around for the replenishing system. The tables and figures show the improvements the countermeasures produced for the worker. The countermeasures reduced the amount of travel the worker had to walk to replenish their cart by 33% to 76% depending on which part of the facility is being replenished. The next data that was collected was the amount of time it took to find random items. Once again we pulled six new random items from the entire list of inventory then instructed someone unfamiliar with the new layout to find these items in the department. The shelving label system and grouping of similar item together allowed the user to find items an average of 79% more quickly. The results can be seen in Table 6.

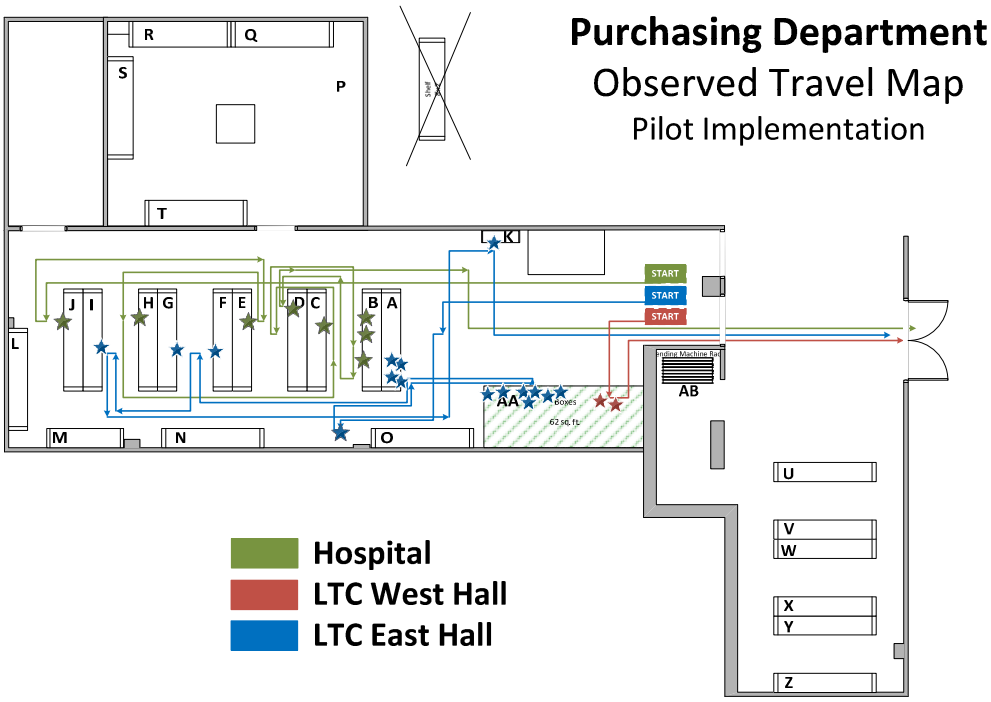

Figure 5: Improved Flow Chart

Table 5: Improved Travel Distance

Observed Travel Distance of Purchasing Employee: New Layout		
Department	**Observed (ft)**	**% Reduction**
LTC West Hall	32	76 %
LTC East Hall	157	63%
Hospital	209	33%

Table 6 Improved Search Time

Search Time for 6 items using new inventory organization	
Time 1	1.63 min.
Time 2	1.60 min.
Time 3	2.03 min.
Average	**1.75 min.**
Percent reduction from current state	79.3%

6. Conclusion

The use of highly visual means to communicate the problem, our understanding, solution generation, and implementation plans in a structured systems approach was very beneficial in translating information to those with different backgrounds. By being able to visually communicate with the client through floor layout drawings and the

data collected with images overlaid onto the map proved to be a very effective, self-explanatory method of providing evidence to the client with minimal confusion. The challenge with this approach was to be able to creatively simplify a large amount of information into a small area that will provide the client with same or greater amount of understanding compared to more typical means of communication. This requires an understanding of those you are trying to communicate with and presenting information in a way appropriate to them. The overall effectiveness of this approach for this project kept meeting and decision-making times short, which provided an increased amount of time to implement solutions within our two-week timeframe.

The other critical aspect about our project was the strict time schedule. Since there was only time for two days of data collection, we were very limited on what data could be collected. The data collections for the search items were very limited. This is because it was only one person tested three different times. This is also relevant for the flow chart. We were only able to map one day of replenishing system. More data should be collected for both tests to make sure that the tests and times are accurate.

Acknowledgements

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