

UNIVERSITY HONORS PROGRAM

SENIOR PROJECT - APPROVAL

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PROJECT TITLE: Materials Management at St. Mary's Hospital

I have reviewed this completed senior honors thesis with this student and certify that it is a project commensurate with honors level undergraduate research in this field.

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Comments (Optional):

Materials Management at St. Mary's Hospital

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St. Mary's Health Care System is one of the fastest growing hospitals in the region. It was originally founded in 1927 as a small hospital to serve the east Knoxville area. It has seen unprecedented growth in the last decade, so that it now has over 800 beds, 1800 employees, and 400 medical staff. The hospital has expanded such that it is unrecognizable from its original structure. This growth has made it difficult for many of the departments to keep up with this growth. Many of these departments are in need of updated procedures and technologies to keep up with the fast paced growth of the hospital. The materials management department is one example of a department that has not kept its practices up to speed with the massive growth St. Mary's has seen lately. The team of students I worked with at St. Mary's was assigned the task of looking at this department and evaluating their current system.

The materials management department supplies the entire hospital with medical supplies, but it is not responsible for distributing medication. The medication is dispersed through the pharmacy, and has no relation to materials management. Materials management supplies each unit separately, and supplies most of them on a daily basis. The ICU is supplied twice a day however, and some departments are refilled on a weekly schedule. There are two storage methods used throughout the entire hospital, and they are open and closed storage systems. The closed method is on the OmniCell system, and the closed method involves storing items in a small supply room within the unit (e.g. ER). All of the items are stored in a large storeroom, and then taken to their destination. The central storeroom is located in the oldest part of the hospital, and this has made expanding or updated even more difficult.

There are close to 2500 stock items in the supply room. These items are stored on shelves and in bins, which are stocked at night when the trucks arrive. Items are distributed by taking supplies to each unit, and also through a window where nurses can come down and get supplies. There are two kinds of items that are kept in the storeroom, stock and non-stock items. Stock items are those that are kept are used regularly and are stocked when they are needed. Non-stock items are not used regularly, and have to be special ordered for whomever needs them.

The supply process is very simple, and does not involve many steps. The first step is when the item is ordered from the supplier when inventory gets to a certain reorder point. The items arrive from the medical supplier (most items are bought from just a few large medical supply firms), and the purchase order slips are checked for accuracy. The items are stocked in the storeroom, and stay there until they are needed somewhere in the hospital. Pick lists are generated on a daily basis for each department, and the listed items are retrieved from the shelves. The supplies are then taken by cart to either their respective OmniCell or unit storage room.

OmniCell (appendix A.) is the closed method of storage in many departments at St. Mary's Hospital. The company's website says that OmniCell is a way for hospitals to "store, dispense, control, and track" medical supplies more "effectively and efficiently." It is a point of use method of dispersion that keeps track of how much inventory is in the system, and when supplies need to be re-ordered. Nurses are supposed to key into the computer what they are taking from the system, and to what patient the item should be charged. This means the computer should know exactly how much each OmniCell contains, and can generate a pick list for the materials management department.

Materials management can then pick the items from the shelves and take them to each OmniCell without ever going to it and physically counting the contents.

We however found several problems with the OmniCell and how they were used at St. Mary's. One is the reorder points and par values that are used to tell the computer when to order more products. The reorder point tells the computer at what inventory level to order more of a product, and the par level is the value that each product is supposed to be kept at. These points many times do not match the level of usage for their particular product. For example, it is not practical to have a par value of four for an item that has been used three times in the last six months. This is the case in many situations, and lowering the par value would save room in the OmniCell. Each OmniCell is also refilled at least one time per day. It would be much more economical to change the reorder points and par levels so that the OmniCells could be refilled less often in non-critical care units. Another problem is that nurses in the hospital are not properly trained how to use OmniCells. They pull more supplies than they need, and then use the excess later many times when they are in a hurry. This makes the data the OmniCell has inaccurate and this problem could be fixed if medical personnel were properly trained in OmniCell usage.

Organization in the OmniCell is also a problem. Items are just stuffed into the OmniCell, or are oriented such that they take up more space than is needed. Smaller items are also given too much space in the unit on too many occasions. The first picture was taken on the third floor illustrates many of the above problems. The second picture was taken in the ICU and illustrates the problem of nurses removing too many supplies. The items on top of the OmniCell were taken out and then placed back on top when they

were not used. The computer either thinks the items are gone from the OmniCell (if the nurse charged a patient for an item), or are gone (if the item was just removed while the



There are several solutions to the problems that are presently seen in the OmniCells. The first thing that needs to be done is re-evaluation of the reorder points and the critical low values. This would mean the departments would not have to be stocked so often. The only place that should be stocked on a daily basis should be critical care units such as the ICU. Records also need to be monitored more closely and updated on a more regular basis. There are hundreds of items on the OmniCell inventory sheets that have never been used or have no usage in the last year. These items need to be eliminated and changed to nonstick items, so that whomever needs them can special order them. There should also be mandatory training sessions for all existing medical

personnel, and orientation sessions for new employees. These solutions should fix many of the problems that are presently seen throughout the hospital's OmniCells.

Another challenge that would if overcome would improve efficiency is the lack of organization within the OmniCells. Drawer modules are available from the manufacturer, and optimize the space required to store smaller items. The company says the drawer module increases per shelf storage capacity from eight to as many as 24 small items. It is also configurable, so it can be made to fit different product lengths and sizes. Bins should also be used to store small to medium items, because they reduce the space required to store these items. They also keep tracking inventory easier because the items are contained in the bin and cannot move about and get lost. The picture at the left is the drawer module, and the picture on the right shows bins being used effectively at the hospital.



The open storage system is only used in a few departments within the hospital. A few examples are the ER and also in nuclear medicine. OmniCell has no involvement in these departments, because the items are just stored in a small room on shelves. There is no tracking of inventory by computer where the open storage system is used, so when the room needs refilled the pick list has to be generated manually. This is done weekly by a

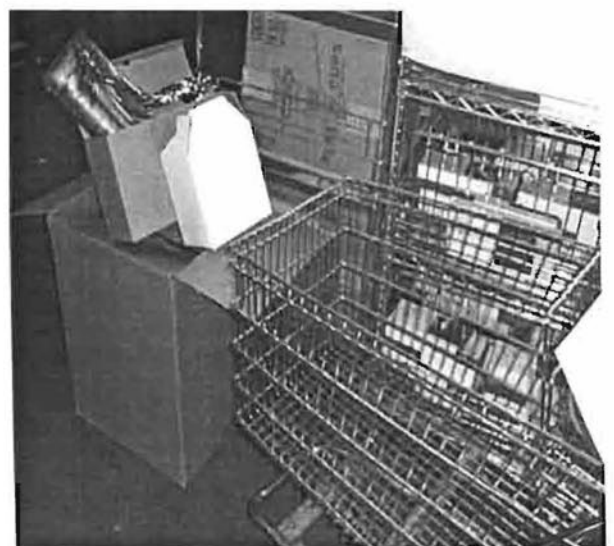
materials management associate who goes to each department and manually counts the inventory. This count is done to see how much of each item is needed to reach that item's respective par value. The associate then goes back to the main supply room and enters this data in the computer to generate a pick list. The items are then picked from the shelves and taken back to the open storage unit. The items also have to be bar-coded so that patients can be charged when an item is used for them.

There are also many problems with the hospital's open storage system. Many of these deal with the layout of the small rooms that the supplies are stored. The organization of the rooms has much room for enhancement, because they are very cluttered and unorganized. The supplies are strewn all over the room, and it is so bad in places that we found supplies located in the sink in one section of the ER. Supplies are not where the layout plan says they should be, and even when they are in the correct place it is difficult to tell how much is there because of the disorganization. The labeling within the rooms is such that it is impossible to tell what supplies are unless you already know. Most shelves have no labels, and all of the items are just thrown on the shelves. There is also no way to track the inventory because materials management associates generate the pick lists manually. This makes obtaining usage data very problematic, because the data that is available is often inaccurate. This is because of the lack of computer tracking of inventory, and also the high amount of shrinkage in the rooms. The shrinkage is attributable to the low security in the supply rooms, and the outdated record keeping procedures. Another cause is that inventory is counted manually for the pick lists, which leads to inaccuracies in the inventory data.

My group identified several solutions that would improve how the open storage systems operated. One is to put in place a bar coding system to keep track of inventory. The usage data would be much more accurate, and it would be much easier to keep up with inventory levels in the departments. The system would be easy to install since all the products in the open system are bar-coded, but it would be challenging to train the nurses to scan an item every time they remove it from the supply room. There would then be a computer record of every item used, so pick lists could be generated through the computer. The security in the supply rooms also needs to be increased, because presently anyone can come and go from them as they please. Bins, dividers, and cabinets also need to be installed so that the available space in the supply rooms can be better utilized. This would improve the efficiency of supplying these units, because it would be much easier to find items. The items would also be confined such that it would be more difficult for them find their way to the wrong place. The labeling in the rooms also needs to be fixed, so that anyone who walked in off the street could find an item by simply looking at the labels on the shelves. All of these solutions involve better organization in general, and just cleaning up these rooms to improve the effectiveness of the system.

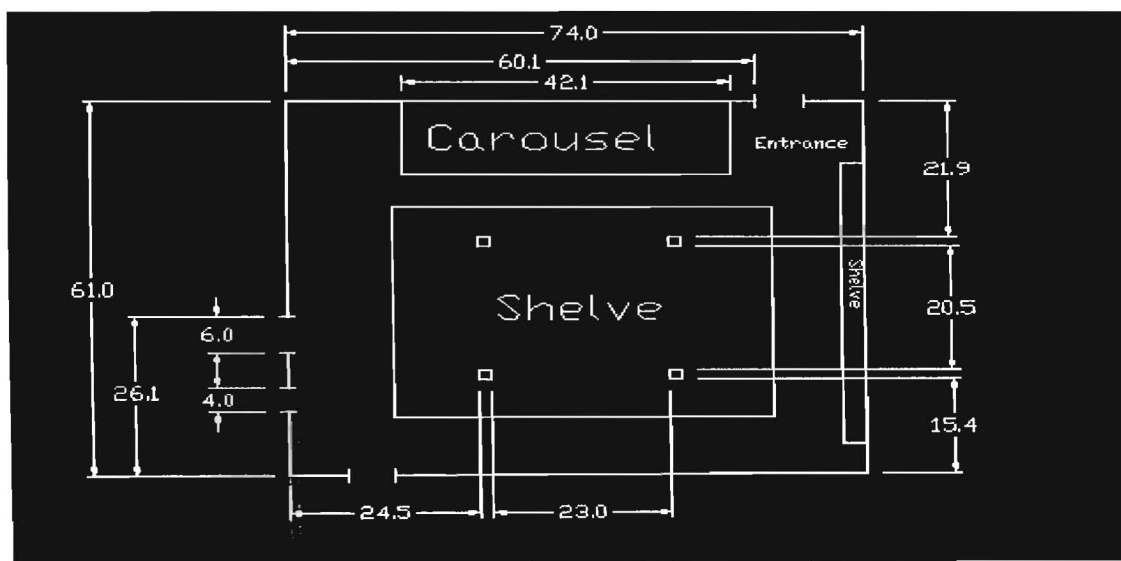
We identified the main storeroom as being the source of many the problems that we found at the hospital. One of these that if fixed would improve the system significantly is that there are far too many items in stock. We performed an ABC analysis on the usage data of all items that had left from the storeroom. We found 458 items with zero usage in the entire hospital over the last six months. We then just looked at the OmniCell records, and found that 633 records in the system had zero usage in the last year.

The storeroom also has several organizational problems that need to be evaluated. One is the labeling on the shelves is very disorganized, and it is hard to tell what the item on the shelf actually is. Items are not labeled accurately, and many have either multiple labels or no label at all. Another problem is that stockers do not break-bulk the shipping boxes before they put them on the shelf. This means that the pickers have to open up the boxes before they can get to the item that they need. Cluttered aisle-ways are another large problem in this area. We found several instances where empty boxes or other items would get in the way of pushing a cart down the aisle. The first picture illustrates the labeling problem; the next shows the break-bulking problem; and the bottom two pictures demonstrate objects impeding motion in the storeroom.



Another area we identified as needing improvement is that grocery carts are being used to transport items through the hospital (appendix B). Lighting and security are two other problems in the storeroom that we saw. The lighting in the room is outdated, and should be brightened because at the current levels strain on the eyes is evident. Security should be looked at because presently anyone can come and go as they please and remove items without anyone noticing. This problem, inaccuracies in the usage data, and organizational issues lead to a high rate of shrinkage in the storeroom.

We developed several answers to fix the challenges that we identified in the storeroom. One is to redesign the layout using the ABC analysis that we performed. We separated the high, moderate, and low usage items into sections in the storeroom. We did this using a 20-50-30 breakdown (A items are those that have the highest 20% usage, etc.) that is used by professional engineers to design layouts for warehouses. We looked at the alternatives for storing and distributing items in a system like this, and found that a carousel (appendix C) was the best alternative. Carousels have numerous benefits, including better usage of space, improved records accuracy, faster picking times for products, and they can be custom built to meet the needs of the hospital. The following layout is one possibility for incorporating a carousel into the storeroom.



There are several other things that need to be done to improve the efficiency and effectiveness of the storeroom. One is that more bins need to be used to store items on the shelves. These bins improve organization, and make picking much faster and accurate. The following picture is an example of bins being used correctly at St. Mary's.



Other solutions include labeling the shelves more clearly and accurately so that anyone could come into the system and pick the correct items from the shelves. Many items also need to be changed to non-stock items because of their low usage. These items just take up space on the shelf, and increase inventory-carrying costs dramatically. Items with low usage should be monitored more frequently, and those with low usage should be eliminated from the stock list. New carts are also needed, and there are several alternatives available from medical and hospital supply firms. Another large challenge is stocking non-critical care units less often, so that the people requirements in the department could be reduced. If all of the data was organized and evaluated this could be done very easily.

If the materials management implemented the ideas that our project team came up with, then the effectiveness of the system would increase significantly. Most of our ideas

involve improving organization in order to increase efficiency. This would be easy to do, but it would take a commitment from everybody involved in the system. Redesigning the layout to put the high usage items in one place would make picking much faster, and the proposed carousel has numerous benefits. We think that if all of this is done, then the materials management will be able to keep up with the explosive growth that is St. Mary's is currently seeing. The main thing that needs to be done to implement these plans is a team effort that starts with top management and goes all the way down to the storeroom pickers.

Appendix A – OmniCell



Appendix B- Grocery Carts



Appendix C – Carousel

