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Professional Paper:

Lake Mead Hospital Conversion to Complete Delivery
System

By

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degree of
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Abstract

The objective of this case study is to determine the cost difference between using a conventional type of inventory system in the operating room versus using a pack system in the operating room. In this study three different ways of delivering disposables for a laminectomy procedure were considered: 1) multiple distributors of disposables, 2) single distributor of disposables, and 3) the pack system (CDS by Medline). The first comparison was of multiple distributors vs. a single distributor with a cost difference of \$90.08 per procedure and \$18,916.80 annually, multiple distributor costing less. The second comparison was between Medline as a single distributor and Medline's CDS pack system; with a cost difference of \$250.13 per procedure and \$52,527.30 annually, CDS pack system costing less. The third comparison was of multiple distributors vs. Medline's CDS pack system, with differences of \$167.04 per procedure and annual differences of \$35,078.40, CDS pack system costing less. Another way that the CDS benefits the hospital is that funds normally tied up in inventory are now available for use in other areas. In a report given to the hospital administration, the reduced inventory has made \$50,000.00 available for other uses.

Introduction

The healthcare industry has changed drastically over the past twenty years. Hospitals no longer simply charge for products and services used and then request reimbursement. In the environment common over twenty years ago, hospitals were reimbursed for cost plus a small profit margin. Success was almost automatic, provided that the hospital had an adequate level of census.

Over the past twenty years Medicare and Medicaid reimbursements have been cut. Managed care and the discounts associated with it has become a major factor in the industry. With reimbursements being reduced all across the nation it has become difficult for hospitals to maintain a profit. Census levels are not the only things that affect profits; efficiency has become a major factor in determining profitability.

Now, healthcare organizations are primarily reimbursed prospectively. Prospective reimbursement may occur based on diagnosis related group. The hospital must therefore be more efficient at providing service in order to be profitable since the reimbursement is established prospectively. This means that no matter how long it takes to treat a patient, or what procedures are performed to treat that patient; the organization is most likely to get

a predetermined reimbursement. Hence, under the new prospective reimbursement scheme, only an efficient and effective hospital is likely to generate a profit.

Hospitals and healthcare organizations must now look more closely at each department in order to save money due to reduced reimbursements and capitated contracts (DeJohn, 1998) (Anonymous, 1996). Under capitated contracts with insurance companies or managed care companies, the healthcare provider is given a specified amount of money to care for a specific group of people, no matter how many of these people are seen or how often they are seen.

One way to cut costs and generate a profit is to improve the efficiency of inventory management. In the later part of the 20th Century, there were many advances in material management. Many Industries recognized the potential to reduce inventories through the implementing philosophies such as just-in-time (JIT) delivery. The idea that supplies are at the point of use only when they need to be there is the key concept to JIT. Part of the idea is to eliminate excess inventory, which means that less money is tied up in inventory and more money is freed-up to be used for other purposes. Decreased handling of products by highly paid personnel, such as a registered nurse, means there is less money spent to get those products where they

need to be. That means not only are funds freed up by maintaining lower inventory levels, but also there is less money being spent on the handling of those products.

In addition to the money that is saved due to stockless inventories, there is also the space factor involved with the storage of inventories. By switching to a stockless inventory an organization has more space to use more productively. Full-time employees are also freed-up to perform other responsibilities. All of these points add up to a more efficient organization.

Consequently, many healthcare organizations have turned to their materials department to reduce costs and create more space for revenue making opportunities. The supply chain in the health care industry has lagged behind the supply chain in other industries (Whitson, 1997).

Research Issue

Are the inventory management approaches that lead to improved efficiency in other industries capable of effecting cost reductions for healthcare organizations too? To answer this question, the CDS pack and JIT systems used at Lake Mead Hospital will be examined.

Recently, the health care industry has begun to adopt the supply chain management practices that have been

successful in other industries. This is what healthcare material managers have done with just-in-time delivery and pack systems. These two approaches have been implemented at healthcare organizations across the United States to decrease waste in the supply chain. The pack system is specifically designed for surgery. With the pack system, all the disposable items needed for surgery are packaged in one box. Reducing inventory is one of the reasons for this program, but it is also designed to reduce the labor costs involved with gathering these items from off the shelves. There is a two-fold advantage to this system, namely reduced inventories and less labor.

Lake Mead Hospital and Medical Center is a part of the Tenet Healthcare Corporation, an investor-owned system. The hospital has a surgery department with six operating suites and one cysto suite. This is a 198-bed facility with 12 intensive care beds and a psychiatric ward.

The hospital is examining ways to reduce costs associated with surgical procedures. One way to accomplish this is to improve the efficiency of inventory management. The practice of inventorying supplies on the shelf ready to be gathered together for each surgery is inefficient and costly.

Inventorying supplies for the operating room can tie up a significant amount of the hospital's funds in supplies that do not create a cash flow until they are consumed. The amount of funds required for inventory can be substantially reduced if inventories are kept at the minimum level required for operations.

Another consideration with regard to inventory is the cost of handling the inventory for use. Considerable labor costs may be required to have surgical staff gather supplies for each procedure. Health care organizations may realize substantial savings by purchasing supplies that are already packaged and ready for immediate use.

Still another consideration is storage space. Shorter time on the shelf for disposables means reduced inventory levels. This frees up space, and space is especially costly in a health care organization.

In short, by reducing inventory and reducing the handling of disposables used in the operating room, the hospital can create a more efficient process for the delivery of disposables. The reduction of inventory will free up funds that would otherwise be required to finance the purchase of inventory. Reducing the handling of disposables will free up expensive labor and increase the returns on their services. Lastly, the reduction of

inventory can save money by saving the space required for inventory storage. All of this will be reflected in better asset turnover ratios when performance is analyzed using a DuPont analysis. A Dupont analysis gives an overview of a business' financial condition. It uses the asset turnover, profit margin, and debt level to do this analysis (Gapenski, 1999).

Lake Mead Hospital has decided to use a new delivery system to accomplish the desired goal. The new delivery system is by Medline Medical and it is called the "Complete Delivery System" (CDS). CDS is a pack system where all the disposables for a procedure are in one box, ready for use. Having all the necessary disposables in one box decreases the number of times these products are handled, therefore decreasing the cost of gathering these goods (Anonymous, 1998). Since all the products are purchased from a limited number of manufacturers, there are bigger quantity discounts. Billing is more accurate because there is only one item to check on the charge sheet instead of multiple items.

The purpose of this paper is to determine which system is the most cost effective: inventorying using multiple distributors; inventorying using one distributor; or using CDS. To do this the cost of the disposables for a

laminectomy procedure is determined, and the cost of handling those same disposables is determined. The funds devoted to inventory are also considered.

Literature Review

The term "stockless inventory" implies the elimination of inventory. The amount of supplies inventoried is at a minimum. Ideally there would be no inventory at all. One philosophy that brings this concept closer to reality is JIT. JIT is a management philosophy of continuous improvement and forced problem solving. This is done by exposing problems and bottlenecks caused by variability. JIT delivery is considered a "pull" type of distribution in contrast to a "push" type of distribution. The traditional type of distribution is the "push" type where the distributor's ability to provide the product is the main drive. But with JIT delivery a "pull" type of distribution is utilized, where the area that needs the product is what determines the supply quantity. (Whitson, 1997)

JIT delivery is a focus on the smooth and continuous flow of products to the point where they can be utilized. (Whitson, 1997) To achieve this they need to eliminate waste. Waste is defined broadly as "anything that does not add value to a product." (Whitson, 1997)

JIT delivery means that the products needed would be available only when they are needed. This assumes that the delivery system is reliable. The item would be delivered to the point of use, bypassing the warehouse. This would eliminate the storage and excessive handling of the item. If this ideal situation could be realized, it is clear that the number of times that each item is handled would be reduced. The less the items are handled, the less money is spent by the organization getting the necessary items where they need to be.

Over the past two decades, many industries have converted to a stockless inventory system to reduce the amount of money tied-up in inventory that is waiting to be used (LaPlante, 1992). This is not a new concept. The idea of a stockless inventory was evident in Henry Ford's production of the automobile. In his plants Mr. Ford had raw materials for the construction of his automobiles delivered to the plant. From there, these raw materials were refined into the component parts needed to assemble the cars. The idea was that the materials were made into the items necessary only when those items were needed (LaPlante, 1992).

Some of the benefits of this system have already been mentioned, such as the costs saved because employees are

not being paid to handle the merchandise unnecessarily. Other ways that this system saves money is by freeing up space that was previously used to store inventory. This can be a direct savings if the space used to inventory supplies is leased. Alternatively, the space can be converted into productive space.

Some sources estimate that there is \$11 billion of waste in the healthcare supply chain (Becker, 2001), (Anonymous, 2000). It should be noted that the term "supply chain" refers to the evolution of raw materials to a consumable and all the way to being recycled. Supply chain management has drawn attention to the way healthcare deals with its distributors and manufacturers, and rightfully so.

The healthcare supply chain system has obviously been behind other industries, so the solution to this problem should be clear to the material managers in health care organizations. The healthcare industry must adopt and adapt the practices that have been successful in other industries. This is just what healthcare material managers have done with the pack system. This program has been implemented at healthcare organizations across the United States to decrease the waste in the supply chain.

One way that healthcare organizations have adapted this is by having medications delivered to the floors in the dosage required (McCollum, Poe, 1990). In this way the nurse does not need to measure each dose for each patient. Instead the medication is ready for administration in the quantity needed.

Another system used by anesthesia departments within the surgical department is the tray system (Stroup, Iglar, 1992). With this system, the medications that the Anesthesiologists may need for the patient, other than controlled substances, are packaged in a tray in limited amounts. There is enough of each medication in a tray for a single procedure. Two trays are generally available for the Anesthesiologists in case there is a need for additional medications. This reduces the amount of medication stored in each operating room and makes it easier to check the expiration dates on the medications.

The pack system is specifically designed for surgery (Harmer, 1995). With the pack system all the disposable items needed for surgery are packaged in one box. Reducing inventory is one of the reasons for this program. It is also designed to reduce the labor costs involved with gathering these items from off the shelves. There is a two-fold advantage to this system: reduced inventories and

less labor. The idea is that little or no products are inventoried, and that money is freed up for use in other areas of the organization. In the healthcare setting the biggest difference is that there is obviously a necessity for safety stock to allow for any emergencies that may arise.

This program has also created a better way of billing for surgical procedures. These pack systems have helped hospitals to reduce the number of suppliers for their inventory, improve utilization and standardization of products, and reduce inventories. This results in more space and reduces costs.

A pack system is a system that contains all the sterile and non-sterile disposable items needed for a surgery in one container. The usual pack contains sterile gowns for surgical personnel, sterile drapes to drape patient, sterile pans, basins clamps, sponges, scrub towels, and occasionally syringes (Anonymous, 1997) (Harmer, 1995). Some include non-sterile items such as suction canisters, suction tubing, and anesthesia circuits.

Traditionally these items are inventoried in the department, and then hospital personnel will pull each item for each procedure. This generates unnecessary handling of products with little return (Harmer, 1995). This

deficiency is one reason why there has been a big demand for the pack systems.

Sometimes packs are customized for a procedure, and sometimes they go so far as to customize them to the surgeon (Harmer, 1995) (Morgan, 2001). An example would be delivery and C-section custom packs which may contain baby blankets, or laparotomy packs that may include a lap T-sheet, back table cover, suture bag, lap sponges, and electro surgical tip cleaner (Anonymous, 1997). These packs are delivered to central supply or directly to the surgical department depending on the delivery system that is being utilized. It should be obvious that this form of packaging is much more efficient and time saving for hospital personnel. The distributor takes on the responsibility of putting these items together for the hospital. The distributor is able to have low cost personnel package the packs instead of higher priced surgical staff.

Standardization and bulk purchasing are best explained by this example in the article on Community Hospitals of Central California (CHCC). When CHCC took a look at the processes within their organization they found that many processes had many different ways in which they were accomplished. This led to multiple manufacturers and distributors all pressuring CHCC to increase usage of their

products to get better pricing. They were getting pulled in multiple directions without any benefits for the quantity of procedures being performed. By switching to the pack system CHCC was able to reduce the number of distributors, increase purchases on specific items, and reduce costs by buying in bulk (Anonymous, 1996).

Healthcare organizations see potential in some areas for the reduction in costs by switching to the pack system; however, these are also the areas that are most difficult to analyze the actual cost savings. These areas are labor, facility overhead, waste disposal, and operating room time. Even though these areas are difficult to measure cost reductions, they do have a major role in the costs of materials, especially in the operating room (Harmer, 1995).

Fairgrounds Surgical Center has a way of measuring the costs of materials used on a per procedure basis. This tool is called the hidden cost calculator, and it can be used to determine the cost of an item when it is stocked individually or in a pack system. This calculator takes into account all the factors mentioned above to give an accurate cost increase or decrease (Harmer, 1995).

Using this hidden cost calculator it is easy to see the potential savings an organization can realize by making the switch to a pack system. The hidden cost calculator

breaks down salaries of hospital staff and tasks of inventorying into a per minute basis. It also breaks down these costs into a per item basis. These cost are then added together to determine total costs of inventorying on a per procedure basis. Money spent on supplies, instruments, equipment, personnel time, and on the facility all add up to the overall cost of performing each procedure. So decreasing any one of these costs will reduce the overall cost to perform that procedure (Harmer, 1995).

Methods

The objective of this case study is to determine the cost difference between using a conventional inventory type of system in the operating room versus using a pack system. The focus will be strictly on the efficient management of inventory materials. The study does not quantify the appeal of this system to the end users. Obviously the appeal is important, but the focus of this study is on the financial aspect and the time aspect of the CDS system.

To analyze these cost differences this study compared the cost differences between inventorying products from multiple distributors, inventorying products from one distributor, and the pack system. To aid in these

comparisons a device called the hidden cost calculator will be used to compare these handling costs.

This hidden cost calculator, in general, is designed to determine the cost of handling an item from the time it is purchased until utilization. It is customized to each facility to make a more accurate cost analysis (Harmer, 1995).

The hidden cost calculator works in this way. The first section of the calculator focuses on collecting data that is used to calculate the cost of handling products. This requires making some estimates about storage fees, salaries of personnel involved with the purchasing, warehousing, and final delivery of the product. The frequency that the product is ordered, shipping costs, and the number of procedures for which the product is used are also relevant to this section (Harmer, 1995).

The results of the hidden cost calculator apply to the actual handling and inventorying of disposables for a laminectomy procedure at Lake Mead Hospital and Medical Center. The hidden cost calculator is applied in three situations below: 1) the case of multiple distributors, 2) the case of a single distributor, and 3) the case of the CDS pack.

Hidden Cost Calculator

Section 1: Facility parameters

Amount of storage space required per item	24 X 24 X 24
Cost of storage space per year	\$1800.00
Purchasing agent average salary	\$36000.00
Purchasing clerk average salary	\$33000.00
Receiving clerk average salary	\$19000.00
Accounting clerk average salary	\$25000.00
OR nurse average salary	\$62400.00
Pharmacist average salary	\$51500.00
Hours worked per year per employee (40 hour work week)	2080
Number of procedures on which this item is used	210
Number of times this item is ordered	62
Average freight cost per order	\$22.00

Section 2: Time estimates

The second section of the hidden cost calculator contains estimates of the time required to get the product from the vendor to the operating room. Again, this requires making some estimates, so the materials manager, who would be best at making these estimates, made these judgments (Harmer, 1995).

Placing an order for this item (not including cutting a Purchase Order)	2 minutes
Receiving this item	5 minutes
Stocking this item	20 minutes
Verifying the invoice for this item	5 minutes
Paying the invoice for this item	4 minutes
Pulling the item for surgery	15 minutes
Opening the item for surgery	5 minutes
Placing an order for CDS	15 minutes
Receiving CDS	5 minutes
Pulling and opening CDS for surgery	15 minutes

Section 3: General Calculations

The third section is the step where the costs of each item, per procedure are calculated. (Harmer, 1995) First the number of hours worked per year is multiplied by 60 to give the number of minutes worked per year (124800 minutes per year). Next the annual salaries are divided by the total minutes per year to breakdown the salaries to a per minute salary.

Purchasing agent salary per minute basis:

$\$36,000.00/124800 \text{ minutes} = \0.29 per minute

Purchasing clerk salary per minute basis:

$\$33,000.00/124800 \text{ minutes} = \0.27 per minute

Receiving clerk salary per minute basis:

$\$19,000.00/124800 \text{ minutes} = \$.16 \text{ per minute}$

Accounting clerk salary per minute basis:

$\$25,000.00/124800 \text{ minutes} = \$.20 \text{ per minute}$

Operating room nurse salary per minutes basis:

$\$62,400.00/124800 \text{ minutes} = \$.50 \text{ per minute}$

Section 4: Single and multiple distributors

Calculations

This section is specifically for handling and inventorying costs related to using single and multiple distributors.

Next is to determine the cost of each task per item performed by the proper warehouse employee salary.

Placing an order: 2 minutes X \$.29 per minute = \$.58

Receiving item: 5 minutes X \$.16 per minute = \$.80

Stocking item: 20 minutes X \$.16 per minute = \$3.20

Verifying invoice: 5 minutes X \$.29 per minute = \$1.45

Paying invoice: 4.5 minutes X \$.20 per minute = \$.90

Total: \$6.93

This represents the total cost per item per order excluding freight. This is multiplied by the number of times an item is ordered each year. Items are ordered on average 62 times a year:

$\$6.93 \times 62 = \$429.66 \text{ per item per year.}$

Annual freight cost:

$$62 \times \$22.00 = \$1364.00$$

Total cost per order per year:

$$\$429.66 + \$1364.00 = \$1793.66$$

Freight and handling costs per order:

$$\$1793.66 / 62 = \$28.93$$

Since there are 210 procedures done each year, but only 62 orders placed each year, the number of items per order is:

$$210 / 62 = 3.387 \text{ items per order.}$$

Freight and handling costs per item:

$$\$28.93 / 3.387 = \$8.54$$

Freight and handling costs per procedure:

$$20 \text{ items} \times \$8.54 = \$170.83.$$

Calculate operating room staff costs on a per procedure basis:

$$\text{Pulling items:} \quad 15 \text{ minutes} \times \$0.50 / \text{minute} = \$7.50$$

$$\text{Opening items:} \quad 5 \text{ minutes} \times \$0.50 / \text{minute} = \$2.50$$

$$\text{Total:} \quad \$10.00$$

Total cost to inventory all items for laminectomy procedure:

$$\$170.83 + \$10.00 = \$180.83.$$

Section 5: CDS Calculations

This section determines the cost of handling and ordering a CDS pack.

The cost of the CDS handling and ordering is 15 minutes to place an order and 5 minutes to receive that order. The purchasing clerk does both tasks.

Placing an order: 15 minutes X \$.27 per minute = \$4.05

Receiving item: 5 minutes X \$.27 per minute = \$1.35

Total cost of ordering and receiving: \$5.40

Calculate operating room staff costs on a per procedure basis:

Pulling and Opening CDS: 15 minutes X \$.50/ minute = \$7.50

It takes a nurse about 15 minutes to get a CDS pack, open it and all of the contents.

The two together cost \$12.90 per procedure in handling the CDS pack.

Cost of Disposables

The total cost of the disposables for each system was determined to be:

Multiple distributors: \$508.79

Single distributor: \$598.88

CDS: \$509.68

The single distributor disposable cost is an estimate. The Medline representative stated that he could not give me an exact price of purchasing items individually from his company; but that they would be 10% to 25% more than the cost of purchasing the CDS pack. The reason for this is

due to discounts given for packing their products in the CDS pack. The percentage used for the calculations was 17.5%, an average of the two percentages. This was determined to be the closest percentage to the actual cost of purchasing items individually.

Comparison of Approaches

The costs for all three approaches were determined using information from Lake Mead Hospital's material manager, Janice Miller, and from the Medline representative, Paul Parkinson.

The first comparison lists all the disposable items and prices of items used in a laminectomy procedure. Along with this information is included the number of different manufacturers and distributors used to obtain these items. Then the cost as determined by the hidden cost calculator is added to the total cost of all the products used in the laminectomy pack to calculate the total cost of inventorying the necessary products.

The second comparison lists the items in the laminectomy pack and determines the price of ordering these items from Medline separately. Then one adds the costs calculated by the hidden cost calculator to the total cost of purchasing these items from Medline. This yields the

cost of inventorying the exact same items found in the pack.

The last cost needed to complete this part of the study was the cost of the laminectomy CDS pack. This price does not need to be added to the hidden cost calculator because it is delivered right to the operating room. All the other costs incurred by inventorying are not incurred when using the CDS pack. The only cost that has to be added to the CDS is the cost of receiving the packs.

Next, the analysis considers the storage costs incurred when inventorying. This is determined by multiplying the annual storage cost by the number of items in the pack. This cost will be added to each of the inventorying systems to account for the funds spent on storage.

The final issue to be determined is the funds that are no longer tied up in inventory. This figure was provided for the study by the material manager surgical liaison at the hospital.

After all the costs have been determined, the cost comparisons will be done. The per procedure differences will be calculated, and then the annual differences will be calculated.

Results

It is important to note that this comparison is for disposables used for one type of surgical procedure, namely a surgical procedure on the spine called a "laminectomy." There are many more procedures performed at Lake Mead Hospital that have CDS packs designed to meet the needs of these procedures. Obviously, not all of these packs will have the same cost differences as calculated for this particular procedure, but similar cost reductions would be expected. In each of the three comparisons there were differences in costs of handling products. These differences ranged from \$90.00 to over \$250.00. Table 1 gives the total cost of handling and inventorying for each of the distribution systems evaluated in this paper.

Table 1

Cost per procedure	Total Cost
Multiple distributors	\$689.62
Single distributor	\$779.71
CDS	\$522.58

Table 2 is a table of the cost differences of each of the comparisons done in this paper. Each cost difference is presented on a per procedure basis and on an annual basis not including annual storage costs.

Table 2

Cost differences	Per procedure	Annually
First Comparison (Multiple distributors vs. Single distributor)	\$90.08 (Multiple distributor being less)	\$18,916.80
Second Comparison (Single distributor vs. CDS)	\$250.13 (CDS being less)	\$52,527.30
Third Comparison (Multiple distributors vs. CDS)	\$167.04 (CDS being less)	\$35,078.40

First Comparison

In the first comparison, the handling cost of inventorying items from multiple distributors was compared to the handling cost of inventorying the items from Medline exclusively. The cost, including hidden costs of inventorying and handling items, was calculated to be \$689.62.

The cost of inventorying items from Medline, including hidden inventorying and handling cost, was calculated to be \$779.71. The cost difference between these two systems is \$90.08. Inventorying and handling of items for these two systems was considered to be the same, so the difference here is due to differences in the cost of the items.

The annual cost difference is \$18,916.80. In this comparison it cost less to use multiply suppliers than it is to use just one supplier. This was not an anticipated difference. The difference is attributed to the cost of

purchasing the items, due to the fact that the costs of handling and inventorying were considered to be the same for both systems. This may not be accurate, since time spent receiving from one supplier would be different than the time spent receiving from multiple suppliers. Nor does this give any cost adjustments for buying bulk from one supplier. Both of these potential adjustments were considered and discussed with the materials manager and the Medline representative and determined not to be significant. Therefore, these calculations may not be exact, but they are considered to be representative of the costs of using Medline as a single provider of disposables for this procedure.

Second Comparison

In the second comparison, the cost of inventorying items purchased exclusively from Medline and purchasing Medline's "Complete Delivery System" (CDS), or pack system with just-in-time delivery, was done. As stated above, purchasing all items individually from Medline including handling and inventorying costs was calculated to be \$779.71. The cost of purchasing the CDS pack from Medline including handling was calculated to be \$522.58. The difference between these two systems was \$250.13. The difference in handling costs between these two systems is

considered to be due to 1) the discounts on individual items when they are put into a CDS pack and 2) due to the reduction of handling items.

The second comparison was between Medline's CDS pack system and using Medline as a single source provider of disposables for the laminectomy procedure. The handling cost differences were calculated to be \$250.13 per procedure and \$52,527.30 annually. The CDS system costs less due to the cost of handling and bulk purchase price of putting items into the CDS. The storage costs were determined by multiplying the annual storage cost by 10 items. Since there is still some inventory on hand, the storage cost was not multiplied by the total number of items in the pack. This produced an annual cost of \$18,000.00. So the total cost difference of handling and inventorying is \$70,527.30 annually.

Third Comparison

Finally the cost differences between inventorying items purchased from multiple distributors and Medline's CDS pack were calculated. The difference in handling costs between these two systems was calculated to be \$167.04 per procedure and annual differences of \$35,078.40. Costs in this comparison are considered to be due to the discounts on items put into the CDS pack and also from the reduction

in handling items. As stated above, the annual storage costs are \$18,000.00. The total handling and inventorying annual costs are \$53,078.40.

The CDS system, which is Lake Mead Hospital and Medical Center's new way of providing disposables for laminectomy procedures, costs less than the inventorying of disposables from multiple suppliers, which was the hospital's old way of providing disposables for laminectomy procedures. This cost difference is due to the handling and inventorying of these disposables. The data used for this comparison is considered to be the most accurate of the three comparisons because the costs of purchasing products for both systems are actual costs. The cost of handling and inventorying are determined from estimates which affect the precise cost of handling and inventorying, but they are estimates determined by the materials manager who has many years of experience as a materials manager and who knows the procedures for handling products and getting them to surgery.

Discussion

In reviewing all three comparisons, the CDS system costs the least of these three options. These are not the only options available to the hospital. There are other vendors for purchasing pack systems, and there are other

vendors for purchasing disposables. Future studies may look at a cost comparison of different vendors, and of cost comparisons of different vendors that would customize their packs to Lake Mead Hospital's needs.

Another way that the CDS benefits the hospital is that funds normally tied up in inventory are now available for use in other areas. In a report given to the hospital administration, the reduced inventory has made \$50,000.00 available for other uses. This is a considerable amount of money that the hospital can utilize to better benefit the hospital.

Other ways that the pack system has helped with efficiency is in the billing of goods. Nurses no longer have to remember all twenty items pulled for the procedure and remember to charge for them. Now, they just have to charge for the pack and all the items are automatically billed. This would be a good area for future research to see how much more accurate the billing of disposables is over the task of billing for each item individually.

Limitations

One might argue that a limitation of this study is that the prices used for this study were acquired from the Medline representative who met with the material manager at the hospital to determine prices of products from companies

other than his own. However, to confirm this information, the material manager was consulted.

Another limitation is that the prices were not all taken from the same time periods. Some of the prices used were from a year ago, and others were current prices.

Still another limitation is that the study uses time estimates to determine handling and inventorying costs. The time references are estimates due to the fact that performing many of the tasks involved with handling and inventorying products are performed in combination with other tasks. Therefore, the only way to determine these time references is to have a person familiar with these procedures estimate the time required to perform these procedures. This was done in this study to determine these times.

Last, one possible limitation is that overtime was not taken into consideration because the majority of the tasks are performed during regular hours. Overtime would affect the overall cost of handling and inventorying, which would increase some of the differences in the study.

Conclusion

Reimbursement changes have forced the healthcare industry to function similarly to other industries. This case focuses on the inventory management of a healthcare

organization. Many other areas of healthcare are also changing to adapt to managed care reimbursement and capitated reimbursement. The bottom line is that healthcare has been forced to become more efficient.

Future research on the rising costs of packs would be beneficial in assuring that the packs do not exceed the costs of handling and inventorying (Barlow, 1992). Another area of interest might be a comparison of the perceived quality of the items in the CDS with items purchased individually from multiple distributors. Since Medline charges 10% to 25% more for their products when purchased individually, one might ask whether they are of a higher quality than the products purchased individually from multiple distributors.

From the information presented in this paper, it is evident that the pack system is beneficial to the surgical department as well as the hospital as a whole. Patients may receive better care because the physicians and the staff are more satisfied with the pack system. Time saved by nurses can now be spent serving the patient. Nurses can spend more time charting. There is less down time for the surgeons and staff, and there is more time for surgeons to communicate with patients concerning their needs. Greater communication means that there could be fewer surgical

mistakes. Even though this is a study dealing primarily with materials management issues, the services provided to patients are enhanced because the materials management side of the service has improved.

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