

Chapter Outline

IMPORTANCE OF MANAGING INVENTORY

- What Is Inventory?
- Special Inventory Management Concerns

INVENTORY REPLENISHMENT SYSTEMS

- Par-Level Systems
- Automated Supply Replenishment Systems
- Exchange Cart Systems
- Requisition Systems
- Case Cart Systems
- STAT Orders

AUTOMATED INVENTORY TRACKING SYSTEMS

- Bar Codes
- Radio Frequency Identification

DISTRIBUTION OF SUPPLIES

IMPORTANT INVENTORY MANAGEMENT CONCEPTS

- Perpetual Inventory Systems
- Alternative Inventory Control Methods
- Total Acquisition Costs
- Inventory Turnover Rates and Service Levels
- Inventory Information Systems
- Space Utilization

IN CONCLUSION

CENTRAL SERVICE TERMS

Chapter 17

Inventory Management

Chapter Learning Objectives:

As a result of successfully completing this chapter, readers will be able to:

1. Review the importance of effective inventory management, and explain basic inventory management concepts.
2. Explain common inventory replenishment systems:
 - Par-level systems
 - Automated supply replenishment systems
 - Exchange cart systems
 - Requisition systems
 - Case cart systems
 - STAT orders
3. Review the use of bar codes and radio frequency identification to track inventories.
4. Describe procedures for effectively distributing supplies to clinical units and the operating room.
5. Review important inventory management concepts.
 - Perpetual inventory systems
 - Alternative inventory control methods
 - Total acquisition costs
 - Inventory turnover rates and service levels
 - Inventory information systems
 - Space utilization

IMPORTANCE OF MANAGING INVENTORY

Learning Objective 1. Review the importance of effective inventory management, and explain basic inventory management concepts.

The management of **inventory** is a critical concern in every healthcare facility, and Central Service Technicians play an important role in this activity. Poorly-managed inventory can create shortages and **stock outs** that directly impact the quality of patient care, and it can also increase operating costs which can have a significant effect on the facility's budget.

What is Inventory?

The term, “inventory” has a broad meaning in healthcare facilities, and it refers to both reusable and consumable items. Let's begin our discussion of inventory by considering some key terms and concepts.

One way to think about inventory is to consider the Central Service Department. There we have three specific types of inventory. First, there are consumable items (supplies such as disposable wraps, detergents, sterility assurance test products, etc.). When the consumable inventory is used up, more supplies must be purchased to replace it. If we allow that inventory to become contaminated or if it expires (outdates), we must also spend additional money to replace the supplies that must be discarded. Therefore, we carefully follow specific guidelines for purchasing, storing, and handling our consumable inventory (supplies) to ensure that we have a safe and adequate supply.

We also have two types of reusable inventory items in the Central Service Department: less expensive items that can be cleaned and used again and again such as carts, rigid sterilization containers, etc., and more expensive reusable items that can also be used many times such as sterilizers and washers.

If we compared our Central Service Department inventories to those in the rest of the hospital, we would think of three different levels of **assets**. One type is **consumable inventory**, items that are

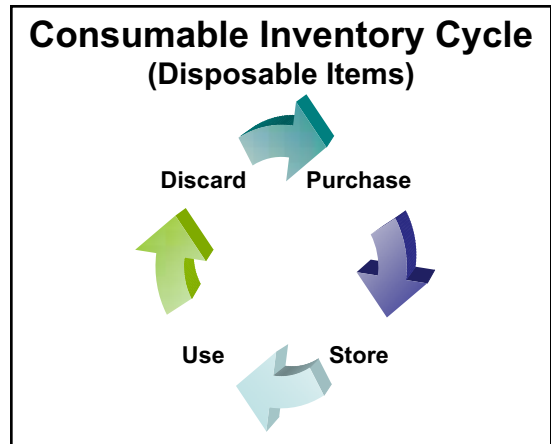


Figure 17.1

used up and replaced. (See **Figure 17.1**) Examples include patient supplies like sutures and catheters, and operational supplies such as office supplies. Lower-cost **reusable inventory** items include wheelchairs, transport carts, etc., and higher cost equipment items would include diagnostic imaging equipment, surgical robotics systems,

Inventory Management and Central Service Technicians

As discussed in Chapter One, the scope of service (responsibilities) of Central Service Departments varies. Some departments provide supplies for the entire hospital; those in other facilities may only provide supplies for Surgery. However, all Central Service Technicians are involved in the inventory management process in some way. Case Cart Technicians work with consumable inventory supplies dispensed for each surgical procedure. Decontamination Technicians must insure that they have an adequate stock of personal protective equipment, and an adequate supply of detergents, disinfectants, cleaning brushes, and other decontamination supplies. Instrument Technicians must have replacement components for implant trays including screws, plates and pins, and they also need an adequate supply of packaging materials and chemical indicators. Central Service Technicians who operate sterilizers require quality assurance products such as biological and Bowie-Dick tests. And for some types of sterilization, they must keep an inventory of the sterilant itself.

Importance of Consumable Supplies

Lack of consumable supplies when needed can delay patient treatment and care and, in some cases, create life-threatening situations. Of lesser, but still important, concern is the customer frustration that can yield poor relationships with caregivers and user departments when needed supplies are unavailable. Inadequate supply problems encourage situations in which customers use unapproved procedures to obtain supplies and hoard (stockpile) them in non-designated supply storage areas. Since patient safety and customer satisfaction is at risk, the need for effective inventory management is evident.

Inventory – Reusable equipment and consumable items that are used to provide healthcare services for patients.

Stock outs (inventory) – The condition that occurs when reusable or consumable inventory items required to provide healthcare services to patients are not available.

Asset – Something of value that is owned by an organization or person.

Inventory (consumable) – Assets such as wrapping supplies, processing chemicals, and other items which are consumed (used up) as healthcare services are provided to patients.

Inventory (reusable) – Assets that are relatively inexpensive such as medical devices and sterilization containers that can be reused as healthcare services are provided to patients.

Equipment (capital) – Assets that are relatively expensive such as sterilizers or washers that require significant advance planning for their purchase.

Inventory (official) – Consumable products found in Central Service and other storerooms, warehouses, and satellite storage areas. Their value is usually included on the facility's balance sheet.

Inventory (unofficial) – Consumable products found in user areas such as surgical locations and labs. These items have usually been expensed to user departments and are stored in unofficial locations.

etc. In healthcare facilities, high-cost reusable items are called **capital equipment**, and their purchase must be planned well in advance when the facility's capital equipment budget is developed so money can be allocated (set aside) to purchase these items. Just as with reusable items in Central Service, these expensive purchases are not made as frequently as are the purchases of consumable items. (For example, we purchase new sterilizers for our department much less frequently than we purchase detergents and disposable wraps from our suppliers).

This chapter will focus on the management and control of consumable (disposable) inventory supplies. Hospital inventory systems and the patients they serve depend on the skills of Central Service Technicians. Inventory management involves much more than just buying items for the healthcare facility. Experienced personnel must identify exactly what items are needed, search for the best value, purchase the items, store them appropriately until they are needed, and transport them to the end user in a timely manner.

Special Inventory Management Concerns

Contemporary healthcare facilities use thousands of different types of consumable products in day-to-day operations. **“Official” inventories** are found in storerooms, warehouses, and/or satellite storerooms. **“Unofficial” inventories** are often kept in user areas (often in multiple locations; for example, the storeroom in the lab and at each laboratory work station). Note: these two types of inventories are discussed in greater detail in the next section of this chapter.

Central Service personnel are consistently challenged to maintain inventory levels so there is not “too much” or “too little” available. Excessive inventory levels result in:

- Too much cash invested in excessive stock levels.
- The potential need to borrow money to pay suppliers for the products delivered.
- More space to store supplies (and space is always at a premium in every facility!).

- Greater risk of damage, loss, obsolescence, and/or pilferage and theft.
- More time required to manage inventory levels.

At the same time, too little inventory can result in:

- Supply shortages.
- Emergency purchases (typically at greater cost than “normal” purchases).
- Negative impacts on patient care.
- Hoarding in user departments.
- Frequent handling to move inventories to point of use.

The inventory values of healthcare facilities can be very significant. Most facilities own approximately:

- \$500,000 - \$10 Million or more in equipment.
- \$250,000 - \$2 Million or more reusable inventory items.
- \$500,000 - \$1 Million or more in consumable supplies

Official inventories of consumable supplies are generally included on the facility’s **balance sheet** as a **current asset**. Inventory locations include the Central Service, Pharmacy, and Food Services storerooms. More recently, Nursing, Cardiac Cath Lab, Radiology, and Surgery supplies have also been considered official inventory.

Unofficial inventories are those not carried on the balance sheet as a current asset, but are maintained at substantial levels in user departments for long periods prior to use. Typically, these items are expensed/allocated to the user departments upon receipt at the facility regardless of when they are actually used.

Inventory levels at most facilities typically exceed those that are required. Consider that:



Figure 17.2



Figure 17.3

- Facilities spend approximately 30% of their operating budget on consumable supplies.
- Overall facility inventories of consumable supplies typically represent an average of 50 days’ usage requirements.
- Facilities typically have a greater value of unofficial than official inventory on hand.

Maintaining sterility and integrity of items while in storage (and at all other times!) is imperative to controlling costs and to assuring patient safety. Storage locations must be maintained and kept clean. If they are not cleaned on a planned and

Balance sheet – A financial summary of what a healthcare facility owns (assets), owes (liabilities), and is worth (equity) at a specific point in time. Example: the last day of every month.

Asset (current) – An asset that is expected to be used within one year.



Figure 17.4



Figure 17.5



Figure 17.6

frequently scheduled basis, dust accumulates which harbors invisible bio-burden. If left on packages, this will contaminate them and, when the packages are opened, these particulates become airborne and fall onto the sterile item. Clutter or overstocking in an area can create tears in packages which may (or may not) be easily visible. However, either way, sterility has been compromised. You've learned that event-related sterility means that an item is no longer considered sterile if a negative "event" has occurred. Contamination from bio-burden and from package tears is an example of these unwanted

"events." These items must be discarded after the supervisor is notified so costs associated with these careless actions can be tracked.

The manufacturer's packaging may be labeled with an expiration date, or it may contain the statement, "Sterile Unless Damaged or Opened" if the manufacturer has designated that the package can be used according to event-related sterility guidelines. It is imperative that each package be inspected for damage before being dispensed and again before use.

Unfortunately, there is no established standard that specifies the package location for the expiration date, or what the marking must look like to help Central Service Technicians check each package. Everyone must assume responsibility to verify that the integrity of each package used has not been compromised, and to check package expiration dates prior to use. **Figures 17.2–17.6** show examples of different locations and methods used by manufacturers to indicate package expiration dates. As you can see, the wide variety of methods used to indicate expiration dates requires a great amount of attention to detail for Central Service Technicians.

In addition to locating and interpreting expiration dates, Central Service Technicians must also understand other information contained on package

Automated and Manual Inventory Systems

Inventory control can be accomplished using manual or automated/computerized methods. Automated systems yield more data because more information can be monitored and stored. Instrument and equipment tracking are examples of systems that can be performed with either manual or automated procedures.

Manual systems involve processing inventory item data using a paper method. Example: when equipment is issued to a patient, information about it is recorded and stored on a paper document until a patient charge is generated, or until the item is returned, and tracking is completed. Manual methods also include information from clinical staff as they request supplies, equipment, or instruments.

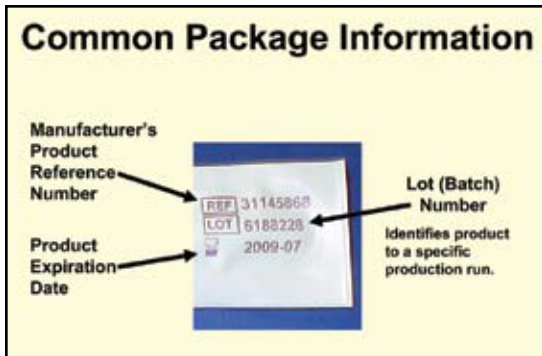


Figure 17.7

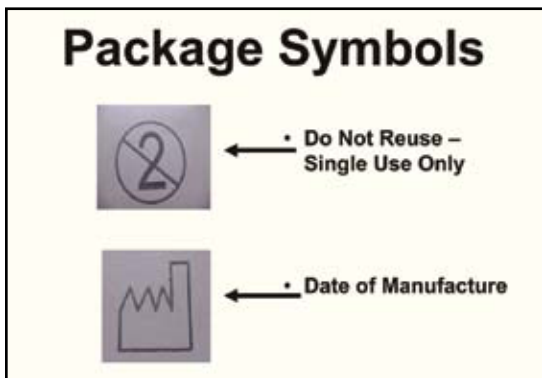


Figure 17.8



Figure 17.9

labels. **Figures 17.7** and **17.8** illustrate examples of this information.

Equipment such as carts and totes used to transport devices/supplies must be cleaned on a frequently scheduled basis. Items that are to be transported outside the facility must be contained in boxes or totes as they are transported. These totes must be cleaned daily to ensure that bio-burden is removed. (See **Figure 17.9**)

INVENTORY REPLENISHMENT SYSTEMS

Learning Objective 2. Explain common inventory replenishment systems:

- Par-level systems
- Automated supply replenishment systems
- Exchange cart systems
- Requisition systems
- Case cart systems
- STAT orders

The method(s) used to replenish needed consumable supplies in patient care units must be carefully considered and planned to best manage costs, to have items available when needed, and to minimize the supply efforts of responsible staff members. Effective systems are, to the extent possible, automatic: no intervention by the clinician is necessary to re-order.

These are several inventory replenishment systems in common use in healthcare facilities.

PAR-Level Systems

Periodic Automated Replenishment (PAR) systems establish a standard level (PAR) for each supply item stored in a specific department. This level is usually jointly determined by the user and Materiel Management staff. After these levels are set, there is typically no need for items to be ordered by clinicians. Instead, Central Service/Materiel Management (CS/MM) personnel inventory each area requiring inventory on an established basis. They check the current on hand supply and note the quantity of each item still available. The amount needed to bring the quantity of supplies to the agreed-upon standard (PAR) is determined, and automatically transmitted to the department. (See **Figure 17.10**)

Unlike exchange carts (see below), there is no need for a second cart that requires restocking, transporting, and staging. Therefore, this system is less hardware-intensive. Only supplies that are required are transported to the department, and this tactic potentially reduces the amount of inventory needed. Also, less space will be used because there are fewer carts and reduced inventory. However, this system still requires labor to transport items to



Figure 17.10

storage areas, and to inventory (count) and restock each department at its supply site(s).

Automated Supply Replenishment Systems

Automated supply replenishment systems use a computerized information system to gather and

***Periodic automatic replenishment (PAR)** – An inventory replenishment system in which the desired amount of products which should be on hand is established, and inventory replenishment returns the quantity of products to this level; often abbreviated to “par system.”*

***Automated supply replenishment system** – Replenishment system in which items removed from inventory are automatically identified and tracked. When a reorder point is reached, item information is generated on a supply pick list in the central storeroom. Items are then issued, and transferred to the appropriate user area.*

track the issuing of patient items. Clinical staff scan or push a button to account for each item removed from the inventory location. PAR levels and reorder points for each item are established. An order is generated at a scheduled time for all items that are at or below their reorder point, and the order for the entire location is then placed. The supply pick list is printed in the Central Service department, and it is used to retrieve (issue) needed items from the central storage area for transport to the appropriate location. This process is repeated for all locations that utilize the automated system.

Available technology also uses information from the order generated by the user location to decrease the quality of items available in the central location. Automated systems can be activated by a label or a button on a shelf that is scanned, or a closed supply cabinet can be used which will not open unless a user enters an access code. In both systems, the user must identify the patient to be charged for the supplies. If, instead, an item such as a box of gloves that may be used by clinicians for several patients is issued, the item is issued to the unit as a floor charge. Then, on a larger scale, when the reorder point in the central storeroom is reached, additional items are automatically ordered from the facility’s suppliers.

Automated systems are generally interfaced with the materials management system for managing inventory with the admission, discharge and transfer (ADT) system for patient census, and with the patient billing system. The use of these interfaces reduces the amount of staff required to perform these functions. The staff can then be reassigned to perform other tasks. These systems do, however require staff that are knowledgeable about the interfaces, computer systems, and how to maintain them.

Automated systems are preferred when there is a need for much information and item tracking that must be frequently reviewed to determine if more instruments, equipment, or supplies are needed.

Benefits of automated systems relate to the facility’s size and the number of items being monitored. Systems are expensive and significant study by the department managers and senior administrators

will be required to determine if a system can be cost-justified for all or some of the remote storage locations. **Figure 17.11** and **Figure 17.12** show photos of equipment used in an automated system.



Figure 17.11



Figure 17.12

Exchange Cart Systems

An **exchange cart system** is an inventory replenishment method that involves the exchange of a freshly-loaded supply cart for an identical cart on a patient unit that has been depleted of most supplies. Supply items and quantities on the exchange cart as well as its location are determined by user unit staff and CS/Materiel Management personnel. At a pre-determined time, a full cart is brought to the unit. The partially-depleted cart is returned to the replenishment area, and remaining items are inventoried to determine the supplies and quantities that were consumed. The cart is then

replenished with the supplies needed to return the cart back to full inventory. As supplies are removed from inventory and added to the cart, they are charged to the budget of the unit which “owns” the cart. At the scheduled time, this full cart is delivered to the unit, the depleted cart is retrieved for restocking, and the cycle repeats.

A major advantage of an exchange cart system is that it is “automatic,” unless there is a need to change the cart’s items or quantities. Clinical staff do not need to order these items, and Materiel Management staff do not have to determine what supplies are needed.

Disadvantages associated with exchange carts include the need for duplicate inventory and carts. The system is labor- and hardware-intensive, and requires adequate space to stage the idle carts. In addition, unless the system is well-managed, numerous unused supplies will be transported back and forth each cycle. However, this system does work well for emergency medical supply carts (crash carts) which are exchanged for a newly restocked cart each time they are used (See **Figure 17.13**).

Requisition Systems

Even when par-level or exchange cart systems exist, it will still be necessary to order additional supplies because of insufficient quantities on hand, or because a specific item is not included among those routinely provided. Requisition systems exist in every facility to fill these needs.

Requisition systems require users to request needed supplies by completing a requisition. This is not an efficient use of clinical staff time and, since Central Service employees do not know what supplies are required in advance, effective inventory management becomes difficult. Requisition systems can be either manual or computer-generated, but they are usually paper-based. However, manual systems do not offer the productivity advantages of electronic order entry with computerized systems. Requisition systems that electronically requisition supplies typically eliminate the need for materiel



Figure 17.13

management personnel to re-enter ordering information into the central inventory system. The accuracy and productivity improvements associated with automated data entry are lost when manual requisition systems are used.

Exchange cart system – An inventory system in which desired inventory items are placed on a cart which is assigned a specific location and quantity. A second, duplicate cart is maintained in another location, and exchanged once daily to ensure that sufficient supplies are available at all times.

Requisition system – A method of inventory distribution in which item needs are requested (requisitioned) by user department personnel, and removed from a central storage location for transport to the user department.

Case cart system – An inventory control system for products and equipment typically used in the operating room which involves use of a cart that is generally prepared for one special surgical case, and not used for general supply replenishment.

Specialty Items

Every facility has need for patient-specific and infrequently ordered specialty items that are not maintained in the routine replenishment system. Central Service Technicians must understand the requisition, ordering, tracking and replenishment processes used by their facility for these items. If a patient is scheduled for surgery and a specialty item is needed, it may need to be ordered several days prior to surgery to ensure that it is available when needed. If an item is not available when needed, the patient, physician, and clinical staff will be justifiably upset, and the patient's well-being may be endangered.

Case Cart Systems

Case cart systems are a common distribution method used to provide specific products for individual surgical procedures. Unlike other forms of distribution that service a specific unit or care group, case carts are assembled to meet the specific needs of each physician for each individual procedure (See **Figure 17.14**)

Case cart systems range from those providing disposable supplies for each surgery to comprehensive systems which provide each case's instrument, supply, equipment, and implant needs. While they are most commonly used for the Operating Room, case cart systems can be used anywhere that procedures requiring supplies and instruments are performed including cardiac catheterization labs and labor/delivery units. When



Figure 17.14

implemented correctly, these systems help to meet the needs of each physician, and still maintain an orderly system for tracking and handling supplies, instruments, and equipment.

Effective case cart systems provide many benefits to healthcare providers and patients, including more standardized infection control practices, cost reduction, and better instrument and supply tracking. Cost reductions are achieved by shifting the responsibility for cart assembly to Central Service personnel who traditionally receive lower salary/wages than do clinical staff.

Case cart systems can also provide effective control of supplies and instruments. Since a separate case cart is assembled for each individual procedure, it is easier to track what is actually used, and to identify supplies and instruments which are requested but seldom used. Quantities of supplies not being used can then be reduced which, in turn, reduces the amount of inventory that must be on hand. Close monitoring of instrument usage allows the facility to shift instruments not being used to other areas where they are needed. Monitoring can also identify instrument shortages which may be addressed with scheduling changes and/or the purchase of additional instrumentation.

Case cart systems enhance infection control practices. Since all instruments are returned to the processing area immediately after use, decontamination and sterilization processes can begin immediately. Central Service Technicians assigned to processing in a case cart system devote all their time and efforts to preparing items for reuse. Since that is their primary job function, they become specialists in cleaning, inspecting, assembling, and sterilizing complex instruments, and this expertise yields better infection control practices.

Case cart systems rely on user input to be effective. Physicians and other healthcare personnel utilizing the case cart must identify their specific needs in advance. These needs are then transferred to pick lists that Central Service staff use to assemble each cart. Care should be taken when developing requisitions to insure that products are standardized,

whenever possible. Routine follow-up is needed to adjust requisition quantities to actual usage.

Properly stocked case carts should be delivered to the user unit. Personnel assigned to the case cart area must maintain direct contact with unit employees so additional items can be supplied as needed. After the procedure is completed, used reprocessable items must be returned to the decontamination area for processing. Central Service Technicians should return unused items to stock, and then proceed with inventory replenishment and charging activities.

While case cart systems typically use carts assembled as needed for specific procedures, most systems also utilize some form of stand-by carts which remain assembled and “on stand-by” for emergency situations. These carts are used for STAT situations (for example, emergency cesarean sections) when there is no time for cart assembly. Instead, case cart personnel keep them complete and ready for use at all times.

An effective case cart system requires good communication between operating room and Central Service personnel. As cases are performed, they must be in constant communication to insure that items are correct, and that they arrive on time. Personnel in each department must be familiar with the routine duties and workflow patterns of the other. Frustration can be eliminated if, for example, surgical personnel understand the steps involved in reprocessing instruments for another case. Instead of questioning instrument turnaround times, they will understand that this time is required for cleaning, inspecting, assembling, and sterilizing according to necessary procedures.

Central Service Technicians working with case cart systems should have good medical terminology skills and a thorough understanding of surgical instruments so that they can easily communicate with their surgical counterparts. They must also remain up-to-date about new products because they serve as the link between the inventory system and the operating room.

Along with effective oral communication skills, case cart systems rely heavily on written procedures and communications. Personnel from both departments

must establish procedures for product handling, outage notification, and scheduling. Even the best planned case cart system will be less-than-effective without good communication.

Case cart systems require significant input from Central Service personnel, and they require a full array of reprocessing skills and solid inventory management methods to be efficient.

STAT Orders

Emergency supply orders requiring immediate action (**STAT orders**) are a fact of life in every facility. These requests usually occur when an item is needed immediately. They can also occur for a procedure scheduled on the next day if the item is not available. These orders are time-consuming and expensive to fill, and they usually disrupt routine inventory control activities. Consider, for example, weekend and off-shift times when additional external resources such as overnight air shipments or borrowing from another facility may be required. All reasonable efforts to minimize the need for STAT requests are needed, and these include reviewing why they occur, and how they can be prevented.

Many STAT requests result from deficiencies in the daily supply and distribution system when it is not well-managed. STAT requests can become a patient safety issue if the root cause is not addressed, and routine reviews may determine if par level adjustments will help to assure appropriate inventory levels.

When STAT requests result from improper planning by clinical staff, Materiel Management/Central Service officials should assist in the planning and education efforts required to resolve the issue. While surgical staff cannot predict that

STAT order – Abbreviation for the Latin word, “Statim,” which means immediately or at once.

Bar code – Numerous machine-readable rectangular bars and spaces arranged in a specific way to represent letters, numbers, and other symbols.

an emergency patient will require a specific non-stocked item, they may be able to plan for such a need, and assure that the item is available.

AUTOMATED INVENTORY TRACKING SYSTEMS

Learning Objective 3. Review the use of bar codes and radio frequency identification to track inventories.

There are two basic types of automated inventory tracking systems that are increasingly used in healthcare facilities. One utilizes bar codes, and the other makes use of radio frequency identification (RFID). Both of these systems must be understood by Central Service personnel.

Bar Codes

Many automated systems utilize bar code scanning which requires the user to line-up the scan indicator beam with the bar code label on the supply item (See **Figure 17.15**), and listen for the read tone. When the scanner reads the bar code the data about that specific product is recorded for use in the materiel management information system. For example, scanners in retail stores read bar codes and transfer information about each product to the cash register during a sale transaction.

Radio Frequency Identification

A new type of tracking system uses **radio frequency identification** (RFID). One example of RFID is the tags used in the retail industry that are placed on items and must be removed before walking out the



Figure 17.15

door to avoid sounding an alarm. Radio frequency applications are different from bar code scanning because they are not limited to line of sight. Low frequency wattage signals are transmitted to radio frequency receivers for network and software inventory applications. This technology is in its infancy, but its potential for tracking movable and other assets is significant. Signals can be transferred through walls and floors, and antennae coverage can only be determined by a technical assessment of reception capability throughout the facility. RFID applications for healthcare are being tested to track expensive supply items and moveable patient equipment.

DISTRIBUTION OF SUPPLIES

Learning Objective 4. Describe procedures for effectively distributing supplies to clinical units and the operating room.

Distribution involves moving supplies throughout the facility (generally from their storage location to the point where they are needed), and includes all clinical and non-clinical supply movements. In most facilities, most of this activity includes distributing consumable supplies from the storeroom or Central Service to clinical units, including surgery.

The goal of distribution is to move the correct items in appropriate quantities to the right places at the right times in the most cost-effective manner by the appropriate personnel.

The routine, scheduled distribution of supplies should address factors such as frequency and/or volume of use, peak activity times, and the amount of storage space available in the areas to which the supplies are distributed. With the exception of STAT orders, distribution schedules often consider:

- Day of the week – Examples: every day or three times a week on Monday-Wednesday and Friday.
- Supply type or category – Examples: medical/surgical every day, and forms and paper supplies once a week.

- Type or user area – Examples: medical and surgical units every other day, and administrative offices once a week.
- Schedule of patient activities – Examples: according to operating room schedules, and the pulmonary unit only on Tuesday.
- Physical location – Examples: “Building A” every day, and “Building F” (across town) only on Friday.
- Quantity required – Examples: twice-a-day for areas requiring large quantities but with inadequate storage, and once monthly for an off-site building with adequate storage requiring minimal supplies.

Many factors must be considered to establish the most appropriate distribution schedule. CS/Materiel Management personnel must work with user departments to establish schedules, and to revise them as workload and other factors change.

IMPORTANT INVENTORY MANAGEMENT CONCEPTS

Learning Objective 5. Review important inventory management concepts.

- Perpetual inventory systems
- Alternative inventory control methods
- Total acquisition costs
- Inventory turn rates and service levels
- Inventory information systems
- Space utilization

Perpetual Inventory Systems

A **perpetual inventory system** is frequently used to manage and control official inventories by maintaining a record about the balance on-hand of each specific item at all times. As items are ordered, received, **issued** or returned to suppliers, the transaction is documented. This allows facility personnel to know, at any time, the quantity of product which should be on hand. For example, assume ten units are ordered and arrive on day one. If there are already eight units available in the perpetual inventory system, there is balance on hand

of eighteen units (10 units + 8 units = 18 units). On day two, if three units are issued, the transaction is documented to yield an on-hand balance of fifteen units (18 units - 3 units = 15 units). As additional issue and receipt transactions occur, the perpetual inventory system allows the manager to track usage. This information is used to update reorder points and quantities, and it provides the manager with real-time information to make decisions to efficiently and effectively manage inventory.

Perpetual inventories are routinely validated for accuracy by taking a physical count of the actual supplies on hand, and by then comparing that inventory quantity to the amount that should be available based upon the manual or computerized recordkeeping system. Any discrepancy between the amount that should be available (from records) and that is available (from physical count) is called a **variance**.

Radio frequency identification – A term used to describe a system in which the identity (serial number) of an item is wirelessly transmitted with radio waves; commonly abbreviated “RFID.”

Distribution – The movement of supplies throughout the facility, primarily consumable supplies from the storeroom to clinical units and reprocessed supplies from Central Service to the operating room.

Perpetual inventory system – A system which keeps track of all incoming and issued supplies so that one knows, on an on-going basis, the quantity of supplies that is in storage.

Issue – The act of withdrawing supplies from storage for transfer to areas where they will be used.

Variance – The difference between the amount of a supply that should be available (from records) and the amount that is available (from physical count) when a perpetual inventory system is used.

ABC analysis – The inventory management strategy that indicates storeroom controls should first address the relatively few items with the greatest value (A items), and should lastly consider the many items with the lowest value (C items).

Examples of ABC Inventory Items



Figure 17.16

ABC Inventory Control

With thousands of items to manage, it is typically not practical to maintain detailed and accurate control over all items. Since some items have relatively little value, **ABC Analysis** allows managers to prioritize the management and control of inventory. For example, “A items” represent those with the largest annual dollar value, “B items” represent a medium dollar value of expenditures, and “C items” represent those with the smallest dollar value. “A items” represent the smallest number and percentage of the total inventory items, but the largest total dollar value, for example Hip and Knee implants. “B items” represent the mid-range proportion of number of items and value of the total inventory. “C items” represent the greatest number and percentage of items, but the lowest total dollar value, for example dressings and sponges. “A items” must be closely managed because of their financial impact. Then, control efforts should focus on the “B items,” and then on the “C items.” **Figure 17.16** illustrates ABC Inventory items.

Alternative Inventory Control Methods

The facility’s purchasing staff must work with Central Service and other departments with official and unofficial inventories to maintain the lowest, most cost-effective inventory levels. Both must understand alternative inventory control methods, and then select/adapt those which are best for their operation. In addition to the systems discussed earlier in this chapter, these alternative methods include:

- **Min/max system** – The minimum/maximum inventory control method requires that the lowest quantity of each supply item which can be available before ordering be determined. (This is called the “safety stock level.”) Then the largest quantity that can be available in inventory should be agreed upon. This information is then used to help determine the quantity of product to reorder. When the reorder point is reached (the minimum amount can be available in inventory), one must reorder.
- **Economic order quantity system** – Products are purchased in the quantity which is most economical (for example, by the case, box or dozen).
- **Stockless supplies** – The supplier provides a complete inventory, storage, and distribution service for the facility, and he/she delivers to user departments on a pre-scheduled basis. Note: although many facilities have some form of stockless inventory system in place, especially for office supplies and/or forms, very few have a true stockless system for medical/surgical supplies. When a stockless system is used, all responsibility for inventory is shifted from the facility to the vendor, and the facility is left without on-hand inventory. The vendor becomes responsible for the daily re-supplying of the facility. In some cases, the vendor even provides the internal distribution function, and delivers supplies directly to user areas.
- **Just-in-time (JIT) system** – Minimal stock is kept on-site, and most orders are delivered when needed. (Note: some medically critical items must always be available on-site.) The JIT system is based upon the Japanese “kan-ban” supply system in which the user and supplier form a close partnership and, because supplies will be delivered “just in time,” the facility inventory levels and related expenses can be reduced. JIT systems shift most of the inventory away from the facility and back to the vendor, so the facility can lower its inventory level and holding costs. One caution: the vendor must manage his/her on-hand quantities to assure that supplies are available when ordered. This system generally

requires more follow-up between the facility and vendor to monitor the vendor’s stock and to consider acceptable substitutions.

All facilities operate some form of JIT system because it is neither possible nor cost-effective to carry an inventory of all supplies that may ever be needed, and some are acquired “just in time”. Many facilities choose to extend this concept by planning supply requirements and working with vendors to schedule orders and deliveries. The more predictable this system, the less inventory the facility will need “just in case.” Ordering patterns for facilities using this method are generally daily to are generally daily (five times) weekly.

- **Consignment system** – Items are stored at the healthcare facility. The supplier owns the inventory, and does not charge for it until it is used or lost. This method requires tight control with security measures. It is also necessary to define who is responsible for replacement in the event of a disaster such as flood, storm, or fire that damages the inventory items.
- **Pick-n-pack system** – Products are ordered from a vendor prepacked for a particular department (generally these items are office supplies and forms).

Total Acquisition Costs

Personnel in the Purchasing, Materiel Management, Central Service, and other departments must analyze **total acquisition costs** to assure that they are minimized without sacrificing quality. Acquisition costs include those related to all activities from product/service requisition to disposal: requisitioning, authorizing, ordering, receiving, storing, picking, distributing, and disposing.

Purchasing is just one of many costs related to the total cost of supplies and equipment. Other related costs of acquisition can include:

- Physical storage costs.
- Disposal of expired items.

Product Standardization Is Important

Clinical and material management staff must periodically evaluate alternative products. Product evaluations should compare equal products, and they should be quantitative and impartial. Lowest price is not the only factor to consider. Standardization of supplies, products, and services promotes low costs for acquisition, receiving, storing, distribution, and patient care services. By contrast, duplication of products and/or equipment increases the cost of materiel management and, subsequently, that of healthcare to the patients. Cost-containment efforts including utilization and product standardization should be high on the list of priorities, and they should be everyone's responsibility. Central Service personnel can be a vital part of this effort as they promote standardization and encourage less duplication. The facility's Value Analysis Committee generally reviews expensive items including those that incorporate new technology. This committee is generally comprised of senior administrators, department directors, material management representatives, finance personnel and physicians.

- Theft/pilferage.
- Obsolescence.
- Freight and delivery charges.
- Stock outs.
- Overstocks (costs of more-than-required quantities of products on hand).

When new equipment is purchased, new or different disposable supplies associated with it may be needed. Sometimes Central Service staff members aren't aware of the need for these new items until they are requested. However, that is not the appropriate time for the Central Service Manager to contact purchasing personnel to determine what item(s) are needed, and how they will be purchased and stocked. A clear process should be in place to identify what additional components will be needed any time that new equipment is planned for. That process should include identifying methods to distribute the components and educate staff about the new items and equipment.

Inventory Turnover Rates and Service Levels

The **inventory turnover rate** represents the number of times per year that inventory is purchased, consumed, and replaced.

Inventory turnover rates should be closely monitored. As they increase, there is an increased chance of stock outs; as they decrease, problems associated with excessive inventory on-hand become more likely. Facilities strive to find the best balance of inventory in order to avoid these problems. Finding the appropriate balance increases customer satisfaction and decreases operating costs.

Inventory service levels represent the percentage of items filled when an order is placed. For example, if 100 items are ordered and 92 are available, the service level is 92% (92 items available ÷ 100 items ordered), and the **inventory stock out rate** is 8% (100% - 92%). If the 8% stock out rate includes medically-necessary items, the inventory service level for these items is not desirable, even though 92% seems to be a high percentage.

Inventory service levels are an important way to measure inventory control and management; however, caution is needed. Since medically-critical items must be on hand 100% of the time, inventory investment/carrying costs can be expensive. Therefore, service levels and costs must be balanced.

Total acquisition costs – All costs incurred by the facility to purchase a specific supply or equipment item from the point of authorization through its disposal.

Inventory turnover rate – The number of times per year that inventory is purchased, consumed, and replaced.

Inventory service level – The percentage of items filled (available) when an order is placed.

Inventory stock out rate – The percentage of items that cannot be filled (are not available) when an order is placed.

Inventory Information Systems

Inventory is virtually the same as cash; without inventory one can have the equivalent value of cash on hand, in the bank, or in some other investment. Also, if inventory is lost, stolen or discarded (example: the expiration date has passed), cash will be required to purchase additional inventory. Therefore, inventory must be managed and controlled, and this occurs, in part, with use of an effective record keeping system.

Most healthcare facilities maintain a significant portion of their inventory under a perpetual inventory system, either manually or electronically. However, some facilities utilize a manual recordkeeping system to maintain on-hand quantities and to note items on order. This often involves a card system which includes the following information:

- Item description, vendor source, and unit(s) of measure.
- Information on orders placed.
- Receipt transactions.
- Issue transactions.
- Adjustments.

Manual recordkeeping systems require much time and effort to accurately maintain the transactions and the on-hand inventory levels. It is also difficult to consolidate data from these records to create meaningful inventory management reports such as for trend usage and service levels.

Facilities increasingly use computerized systems to manage and control all or part of their inventories. Numerous variations in systems and how they are used exist:

- Some materiel management specialty information systems are specifically designed for inventory management; others are one component of a broader financial management system.
- Some systems are micro- (or mini-) computer-based, while others are mainframe

systems fully integrated with the facility's financial, patient care, and other systems.

- Some systems include all materiel management responsibilities; others are used only for inventory control or purchasing.
- Some systems are department-specific; others control inventories for all departments within the facility.

Benefits of a computerized system include their ability to allow inventory transactions to be processed quickly. They provide well-organized and analyzed data to help make inventory decisions helpful in adjusting order quantities and order points, tracking utilization for supply cost allocation or budget development, and calculating service levels from the vendor to the facility and then to user departments.

Stock Locator Systems

Assigning physical locations and codes for all supplies in central inventory enables department personnel to identify that area of the storeroom and/or warehouse where an item is stored. This is especially useful when storeroom personnel must fill supplementary and/or on-demand orders for staff members who come to the storeroom. In addition, when coupled with an automated materiel management system, location codes allow order picking documents to be produced in location sequence. This directs order pickers to the various stock locations through the most direct and efficient route. Stock locator systems also provide assistance when a nurse or other user department employee must obtain an item from the storeroom after hours, and locate it without anyone's help. The locator system should be both manual and electronic for ease of use. Any supply maintained in any location within the facility should have an assigned location (sometimes referred to as a bin location). A paper copy can help assist in areas that do not have automated supply cabinets. This bin location is also interfaced with the case cart system, if used, to create a path for the staff to pull the items for each preference card in sequence.

Computerized systems require a substantial investment, and will not likely eliminate staff because data entry is required for all the routine transactions associated with inventory management and control. They will, however, provide meaningful and valuable information to manage inventories.

Space Utilization

Storage space utilization is often a significant concern, especially in facilities where services have outgrown allocated space, and/or when storage areas are in high demand. Most facilities are constantly searching for additional space. An efficient storage and supply system can improve the order picking process, enhance inventory management activities, and free-up space for use by other departments for other functions. Central Service Managers must always be creative about the best ways to work within the space allocated to the department. When the space is no longer available, when the department is moved to another location, and when outputs must increase, staff must work as a team to develop new processes and work flows.

While square footage of available space is important, cubic footage (volume) should be maximized as well. For example, storeroom capacity can often be substantially increased by additional vertical storage. Storage locations should be assigned beginning with the top shelf (left side), and then moving across the shelf and then to the next shelf with this process continuing for other shelves. Be sure to leave space in between each bin location for future add-in items.

Maximum utilization of cubic footage is an important factor in the efficient use of cart space and loading of supply trucks. When placing items on shelves, make sure that the bin(s) or item(s) fill the space from front-to-back and top-to-bottom because this will make best use of available shelf space. Placing items of like size and type will assist in space utilization. If there is excessive space between the shelves (top of item to bottom of higher shelf), consider adding additional shelves to add items or increased quantities of items or the reverse: remove shelves to accommodate the space needs of bulky items.



Figure 17.17

Gravity Flow Racks

As suggested by their name, gravity flow racks use gravity to allow for the efficient picking and re-supplying of fast-moving or heavy supplies. Open and accessible from the front and back, these racks have shelves that are positioned at a downward slope. This allows supplies to slide from the back over tracks or rollers to the front. (See **Figure 17.17**) As each item is removed from the front, the item behind it slides down and into the front place. Gravity flow racks allow easy and fast frontal access to a large quantity of supplies while also allowing efficient stock replenishment from behind the units to help ensure stock rotation.

The use of these racks, when combined with less accessible high-density storage for slower-moving supplies, allows Central Service personnel to balance square and cubic footage storage utilization in a cost-effective manner.

IN CONCLUSION

Inventory management is an important part of every healthcare facility. Managing inventory effectively and efficiently assists caregivers in providing quality care at lower costs, and even more importantly, it ensures that the items needed to provide care and treatment for patients are available when needed. When Central Service and Materiel Management staff work to manage and control inventory, they contribute to creating a safe environment for the patient and they increase patient satisfaction.

CENTRAL SERVICE TERMS

Inventory

Stock outs (inventory)

Assets

Inventory (consumable)

Inventory (reusable)

Equipment (capital)

Inventory (official)

Inventory (unofficial)

Balance sheet

Periodic automatic replenishment (PAR)

Automated supply replenishment systems

Exchange cart system

Requisition system

Materiel management personnel

Case cart system

STAT order

Bar code

Radio frequency identification

Distribution

Perpetual inventory system

Issue

Variance

ABC analysis

Total acquisition costs

Inventory turns

Inventory service level

Stock out rate