

Planning Issues for Hospital Pharmacies with Growing Outpatient Populations

In recent years, there has been an increasing emphasis in healthcare on the provision of ambulatory care services. It is predicted that in the next few years, 80 percent of all healthcare services (including surgery) will be delivered in an outpatient setting. This shift away from acute hospital care is due to several factors. The incentives by managed care have led to a decrease in hospitalization rates and length of stays. Advances in technology have made less invasive procedures possible on an outpatient basis. As ambulatory care services grow, hospitals will be reserved for the most acutely ill inpatients.

How does this impact the planning of hospital pharmacies?

As outpatient procedures continue to grow and as hospitals increasingly become the repository for the most acutely ill inpatients, the hospital pharmacy will be in a constant state of transition. These trends will affect the work process in the hospital pharmacy and the storage and handling of pharmaceutical supplies.

Pharmacy space planners will need to become more involved in and understand the issues that impact the relative proportions of storage, work process, and drug distribution spaces in the layout of the pharmacy. Asking the right questions and getting the appropriate answers will contribute to planning a pharmacy layout that will respond to this changing environment.

This paper will address the impact these changes may have on the clinical work within three areas of a “typical” hospital pharmacy – Bulk Stores, Outpatient Pharmacy, and Inpatient Pharmacy.

Although the three areas have similar functions, the way they manage their inventory differs. This paper will discuss the requirements of inventory management as it relates to the ordering, receiving, storing, and distribution of supplies in each area.

This paper includes sample floor plans as well as examples of questions that planners need to ask to assist them in addressing planning issues in this changing pharmacy environment.

1. Bulk Stores

As the number and variety of medications expand to treat more acutely ill patients and to fill the increasing volume and diversity of prescriptions for outpatients, many hospital pharmacies are implementing a just-in-time (JIT) inventory delivery system from vendors. A JIT system supplies items as close to the time of use as possible in an effort to reduce large inventories, decrease space requirements, and lessen financial outlay.

The growth and emphasis on JIT delivery and stock in the pharmacy means there is less volume of individual items, but more deliveries more often. This may reduce the amount of space required for bulk storage, but increase the amount of space needed for vendor bins, carts, pallets, and totes.

The clinical work area in Bulk Stores is typically divided into four functions to support inventory management:

- Ordering
- Receiving
- Storing
- Distribution

Ordering

This area provides the link to pharmaceutical vendors for JIT delivery and stock. This requires a number of computers and printers that are linked to these prime vendors and to other areas of the pharmacy for inventory control. Since inventories are kept to a minimum with JIT, they must be monitored closely to ensure adequate supplies are kept on hand. Electrical and data access must be provided for the equipment.

Receiving

In the “breakout area,” supplies are removed from their outer containers or vendor bins. This process will require a large work table, preferably mobile and height-adjustable. Space should be allotted for receptacles used for packaging materials sorted for recycling.

In addition to this work center there should be a hand-washing sink, a storage area for JIT vendors, and a large reusable trash receptacle on casters.

If bar codes are not supplied by vendors, they may be applied to the stock here. This may require a separate workstation for a computer and the bar coding equipment as well as storage for bar coding supplies.

Storing

General Storage: After the items are “broken” out of their outer containers, they are stored in the general storage area. Pharmaceuticals must be separated and stored by category (for example, orals, topicals, liquids, eye drops, ear drops, vaginals, nasal sprays, injectables, etc.). Expiration dates of perishable drugs must be considered, and stock rotated as required. A separate area also is required to hold outdated, obsolete, or recalled pharmaceuticals that need to be returned to vendors.

This requires shelving of various depths and heights to accommodate the variety of items that need to be separated by category.

General storage will also require a refrigerator, a freezer, and utility carts for moving supplies throughout the pharmacy.

Controlled Substance Storage: Narcotics and other government-controlled substances are stored in a vault or locked room in the pharmacy, usually located away from the primary entrance, but in a highly visible location.

The vault is a separate room with walls and a door to restrict access to controlled substances with schedules II through V. Schedule II narcotics remain inside the vault until needed. Daily supplies of schedule III through V narcotics may be removed from the vault and stored in a secure area in both the Outpatient and Inpatient Pharmacies.

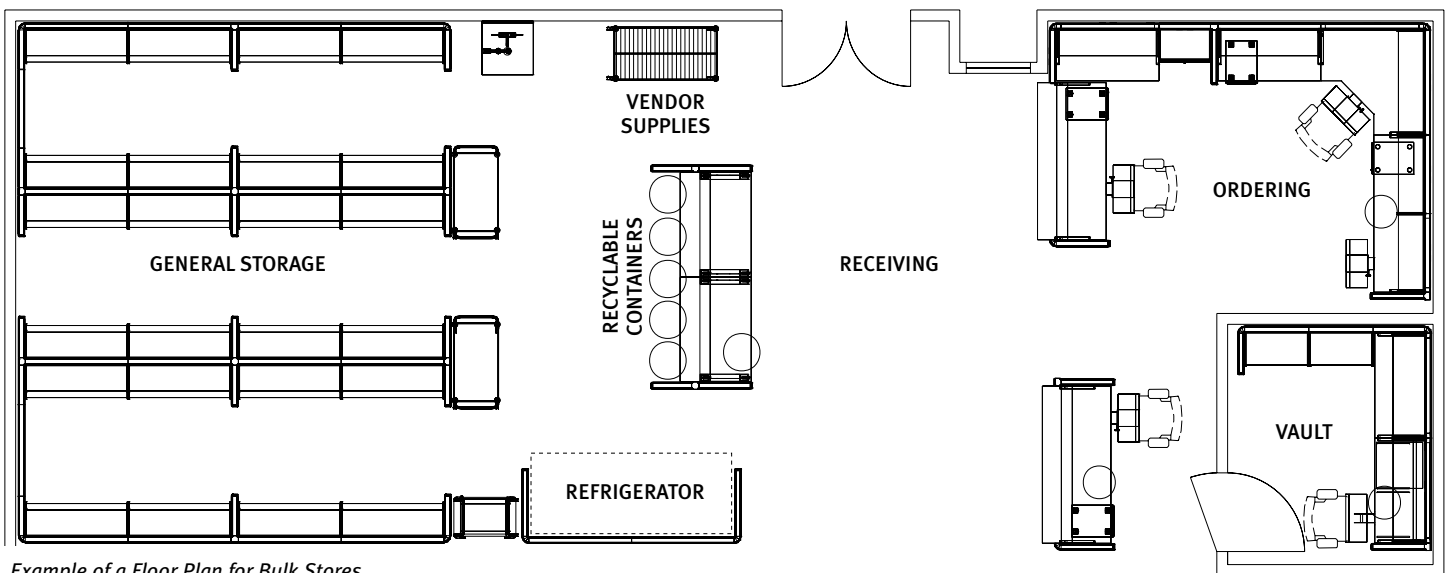
Within the vault there may be a refrigerator, a workstation with computer support for inventory control, and storage. Outside the vault, a small workstation may accommodate staff who monitor access to supplies from the vault.

Distribution

Bulk Stores is responsible for restocking both Outpatient and Inpatient Pharmacies.

Questions to Ask about Bulk Stores:

- How are supplies ordered and delivered?
- How much space is required to receive and break out supplies?
- How many linear feet of storage are required? What amount of space is required for trash receptacles?
- Is there a requirement for bar coding? Describe the bar coding system in the pharmacy.
- Do you need to maintain separate stocks for inpatient and outpatient inventories?
- Is the vault located in this area? What are the requirements for the vault? Describe the controlled substance supplies distribution system.



Example of a Floor Plan for Bulk Stores

2. Outpatient Pharmacy

Pharmacists and technicians in the Outpatient Pharmacy are responsible for filling outpatient prescriptions and for providing pharmacy stock to clinics and off-site centers. The Outpatient Pharmacy functions much like a retail pharmacy. It has completely different products and distribution systems than the Inpatient Pharmacy. The size of the Outpatient Pharmacy is contingent on the number of outpatients served by the hospital.

The clinical work area in the Outpatient Pharmacy is typically divided into four functions to support inventory management:

- Ordering
- Receiving
- Storing
- Distribution

Ordering

This area provides the link to Bulk Stores for delivery of stock. This requires an administrative station with computers and printers. Electrical and data access must be provided for the equipment.

Receiving

Supplies from Bulk Stores are received here on a daily basis or several times a day. This area should be in close proximity to Bulk Stores.

Storing

Active Stores: The supplies received from Bulk Stores are stored here and are used for filling outpatient prescriptions and for supplying outpatient clinics and off-site centers. As in Bulk Stores, pharmaceuticals must be separated by category (orals, topicals, liquids, eye drops, ear drops, vaginals, nasal sprays, etc.). This will require shelving of various depths and heights to accommodate the variety of items that need to be separated by category.

This area will also require a great deal of space to store the volumes of paper products needed to fill prescriptions – printer paper, prescription labels, prescription bags, warning labels for containers, as well as hard copies of prescriptions.

Manufacturing: The manufacturing area provides, when requested, the compounding and manufacturing of special prescriptions for outpatients that are not available commercially. This area requires a work counter, computer, storage cabinet, and sink with an area for drying glassware.

Prepackaging: In the prepackaging area, medications in both liquid and tablet form are divided and packaged as needed in smaller containers for outpatient use.

Manufacturing and Prepackaging may be located in a self-contained room.

Distribution

Order Entry: Prescriptions come into order entry as hard copies at the dispensing windows (handed from patient to pharmacy staff), electronically via computers (from physician to pharmacy staff), or by automated phone-in system (from patients requiring refills). This information is input into the computer system where it is checked for warnings of interactions with other drugs and for potential allergic reactions by the patient. Once these warnings are cleared, the computer generates a label on a printer with the name of the patient and medication required.

The size of this area and the number and layout of stations will be impacted by how the prescription information is received. Work space will require computers, printers, telephones, fax machines and/or scanners, and some paper storage.

Some pharmacies utilize a computerized queuing system to triage the prescription information – triggering the sequence of filling prescriptions based on priority factors. This requires an administrative support station for computers and printers.

Filling: Fill lines are workstations where pharmacists or technicians manually fill prescriptions. At the beginning of the fill line, the prescription label is used as the “picking list.” The container is filled with the appropriate items, and at the end of the fill line the pharmacist checks the filled prescription against the computer and does a visual check as well. The filled prescription is put into a paper bag which is placed alphabetically on shelving close to the dispensing window.

Each fill line may have two computers, one linked to order entry to print the prescription labels, the other, used by the pharmacist, to check the accuracy of the filled prescriptions. Fill lines require a work counter with shelving for storage of fast moving items along with shelves and bottle drawers below the work surface. The number of fill lines and computers will be determined by the number of outpatient prescriptions needed to be filled.

The fill station can assume different configurations. If the work performed at the fill area needs to be separated from patient contact, the configuration is often a straight line located away from the order entry/dispensing window. This results in more privacy for the staff and may speed up the time necessary to fill prescriptions.

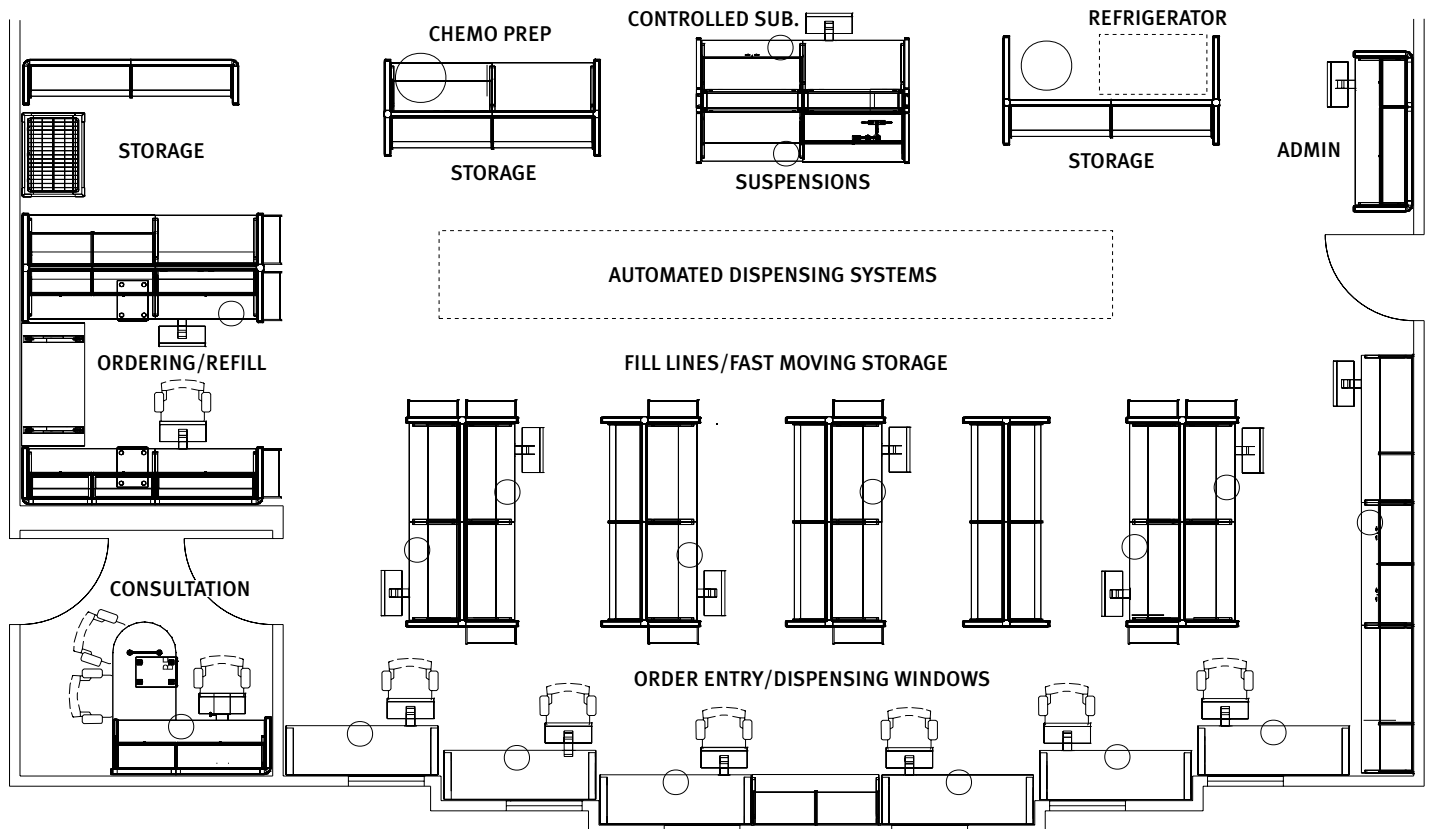
If the pharmacy wishes to promote patient contact between staff and patient, the configuration may take the form of a pod. This is often an L-shaped workstation. One staff member enters the order, fills the prescription from shelving located next to the window, and dispenses it to the patient. This configuration offers the most privacy for the patient and promotes consultation.

Fill lines accomplish 80 percent of the filling, but there are other work counters that need to be accommodated. Controlled substances require a separate work counter with locked storage. This area is typically located away from the fill line to facilitate the privacy and concentration required. The preparation of suspensions requires a sink and distilled water. Here the staff adds a predetermined amount of water to a powder to create a suspension. Some pharmacies may also require chemotherapy stock. This station will require a hazardous waste receptacle.

The growth of outpatient services means larger stocks of medications. As a result, many pharmacies use automated counting/dispensing systems to fill prescriptions faster and more accurately. Some of these systems are floor mounted, while others may need work surface support. These systems require shelving to hold separate stock with special manufacturers' numbers that the equipment can recognize.

Innovations in technology also have enabled the use of robotics to replace the staff time spent on tedious and repetitive functions, as well as increase the accuracy of filling. This speeds up the medication delivery time and frees the pharmacist to spend more time with patients. Robotics equipment takes up additional floor space, which may be limited in some existing facilities. There also needs to be space allotted for storage of repair parts for maintaining the equipment and separate stock with special manufacturers' numbers that the robotics can recognize. Robotics have unique requirements for utilities – gas, air pressure, and electrical.

Dispensing: Dispensing windows are for outpatient prescription drop-off and pick-up. The number of windows required depends on the volume of outpatient prescriptions that need to be processed.



Example of a Floor Plan for Outpatient Pharmacy

As a general rule, eight windows will support a maximum volume of 12,000 to 14,000 prescriptions per month. The windows should be positioned to support patient confidentiality and address ADA (Americans with Disabilities Act) requirements such as wheelchair access.

Administrative space is needed for outpatient consultation where pharmacists can meet with patients and their families to discuss medication programs, give instructions in administration, explain expected drug results, and caution against possible drug complications. A separate, enclosed consultation room increases patient confidentiality in discussing illnesses, drug treatments, and financial matters. Traffic congestion and traffic patterns are becoming more complex as patient consultations within the pharmacy grow at a rapid rate.

Questions to Ask about Outpatient Pharmacy:

- How are prescriptions received and entered?
- How many prescriptions are filled per day?
- What is the process for filling prescriptions?
- What type of automated dispensing equipment is being used?
- Is there a need for a controlled substance station?
- How much space is needed for manufacturing?
- What are the requirements for packaging?
- Is there a need for a work counter to prepare suspensions?
- What type of refrigeration is required?
- How are prescriptions dispensed to patients?
- Does this pharmacy support sites other than the hospital?

3. Inpatient Pharmacy

The Inpatient Pharmacy is responsible for filling orders for unit dose medications and intravenous (IV) medications for inpatients on patient units.

Hospital-dispensed medications are packaged in single doses for accuracy and efficiency of dosage administration. These single-dose packages are referred to as “unit dose” and are usually the most frequently ordered or high-volume-use medications.

Medications are also administered in intravenous (IV) fluids. These medications are added to the IV fluids by the pharmacy and delivered to the patient units.

The clinical work area in the Inpatient Pharmacy is typically divided into four functions to support inventory management:

- Ordering
- Receiving
- Storing
- Distribution

Ordering

Active Stores: This area provides the link to Bulk Stores for delivery and stock. This requires an administrative station with computers and printers. Electrical and data access must be provided for the equipment.

Patient Unit Support: This area may house the mainframe computer linked to automated dispensing machines for controlled substances located on the patient units. These inventories are monitored on a regular basis and refilled as needed from the inpatient pharmacy.

Receiving

Supplies from Bulk Stores are received here and taken either to unit dose picking or to IV/admixture storage.

Storing

Supplies for unit dose picking are stored in the picking stations. IVs are stored in the IV/admixture rooms.

Manufacturing: The manufacturing area provides, when requested, the compounding and manufacturing of special prescriptions for inpatients that are not available commercially. This area requires a work counter, computer, storage cabinet, and sink with an area for drying glassware.

Prepackaging: In the prepackaging area, bulk medications are divided and packaged as unit dose for inpatient use.

Manufacturing and Prepackaging may be located in a self-contained room.

Distribution

Order Entry: Order entry is the “communications hub” of the pharmacy and is often in a central or front location. In this area, written medication orders are received and reviewed by the pharmacists. Orders are compared with the patient’s medication history or profile to prevent the administration of antagonistic or duplicated drugs. All hard copies of orders are generally stored in this area.

Work space must be provided for several staff, as well as sufficient file and equipment space (telephones, computers, printers, paper shredder, fax machine, and copy machine).

Unit Dose Picking: The need for the retrieval of the most frequently used medications in an efficient, time-saving manner has led to the development of the unit dose picking station. This workstation provides a space of limited dimensions containing a maximum quantity of drugs and allows the pharmacist or technician to “pick” the appropriate drugs. Orders can be filled with little wasted time and motion by having high-volume or fast-moving drugs within an arm’s length.

The unit dose picking stations can be planned in many different configurations based on space parameters, number of drugs to be dispensed, additional functions and equipment within the station, and the number of staff using the station.

Picking stations require storage space for pharmaceuticals separated by category (orals, ingestibles, and topicals). They also need work surfaces where the unit dose can be filled and checked. Typically, there are carts for organizing and containing the stock for delivery to patient units and small mobile work surfaces that can be positioned where needed.

IV/Admixture: A specific area of the pharmacy is designated for the function of adding medications to IV fluids prior to administration to the patient. The process of preparing IVs may also be known as sterile preparation of parenteral products or IV admixture.

The IV/admixture area requires a large refrigerator, freezer, and generally two carts – one to hold a supply of IV bags and one for delivery to the hospital. The injection of medications into IV fluids is carried out under a horizontal or vertical airflow hood. A large work counter is needed near the hoods for checking the IVs. Also required is a sink with an eyewash station and storage area for IV additives. IV/admixture may also have its own order entry station with computers, printers, and fax machine.

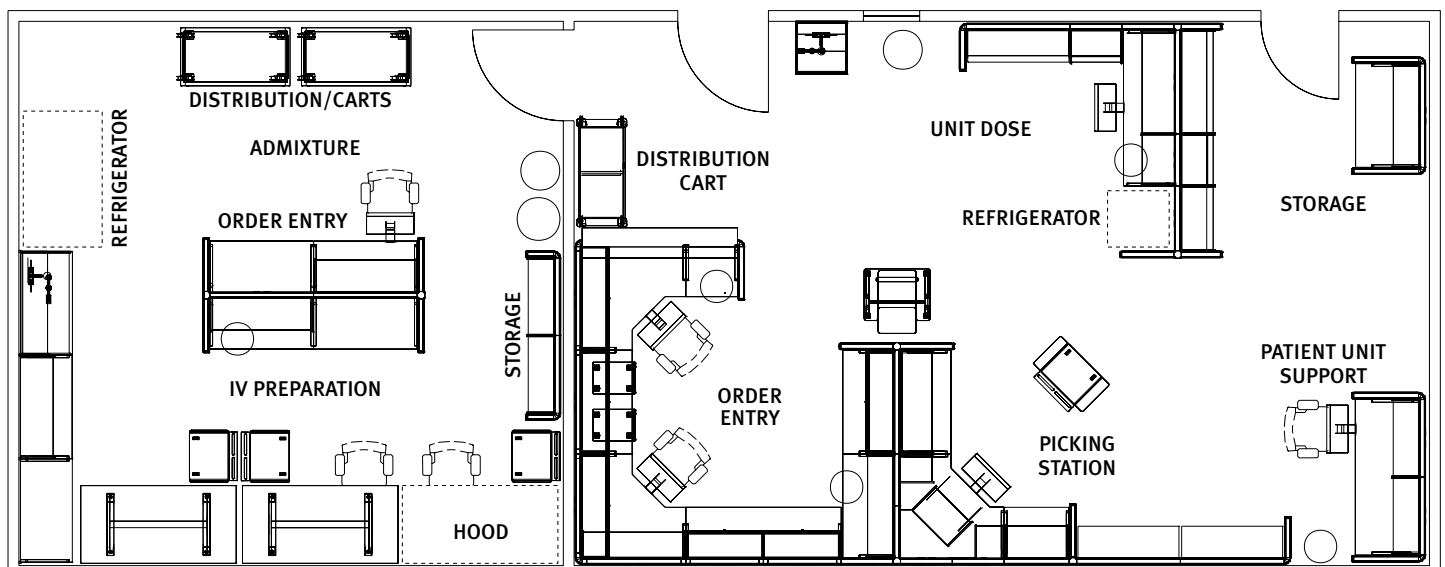
Although code requirements may differ, the IV/admixture area must be the cleanest part of the department. It is usually in a closed room with positive pressure for isolation and cleanliness in preventing contamination.

Some facilities are required to utilize a Class 10,000 cleanroom for IV preparation that is free of contaminants and in which micron-sized particles are screened out. This type of cleanroom can effectively remove viable microbes by removing particles (less than or equal to 0.5 microns) from standing surfaces and incoming air. This air purity is achieved through the creation of a shell or secluded area that is sealed off from the rest of the environment.

As the census of hospitals becomes populated with increasingly more ill inpatients, IV/admixture use will increase. IVs will be infused with more complicated, expensive, and perishable drugs such as biotech drugs, hyperalimentation, and the mix of several drugs in one IV.

Questions to Ask about Inpatient Pharmacy:

- How are orders entered?
- How many unit doses are prepared/day?
- Is there a need for a unit dose packaging machine?
- How are medications delivered to patient floors?
- Is there a requirement for a controlled substance mainframe?
- Does this pharmacy restock the medication rooms on the patient floors?
- How many IVs are prepared/day?
- How does the pharmacy handle storage of bulk supply of IV bags?
- Is there a requirement for a refrigerator/freezer?



Example of a Floor Plan for Inpatient Pharmacy

Conclusion

As the emphasis in healthcare continues to shift toward outpatient care, pharmaceutical services will be provided in a variety of settings in addition to hospital outpatient departments – freestanding pharmacies, ambulatory clinics, assisted living centers, and others. As a result, the relative proportions of storage, work processes, and drug distribution spaces in the layout of pharmacies will continue to change in response to this changing environment.

Herman Miller for Healthcare has experience in planning work process, storage, and materials handling systems for pharmacies. We would be happy to share our knowledge and expertise in these areas with you and your project teams.