CHAPTER 46

Pharmaceutical management for health facilities

SUMMARY

Health facilities are the last component of the pharmaceutical supply chain. Managing pharmaceutical supply at the facility level directly affects the quality of health care. If medicines are consistently unavailable, patients suffer and staff members lose motivation. Everyone loses confidence in the health system, and patient attendance decreases. A constant pharmaceutical supply promotes effective care, inspires confidence in the health facility, and contributes to job satisfaction and self-esteem among staff.

Every health facility, however large or small, needs to store and manage its medicine stocks. Systems must be in place to ensure—

- Secure storage
- Storage in correct environmental conditions
- Accurate record keeping
- Effective reordering
- Effective stock rotation and expiry monitoring
- Effective fire and theft prevention

Health workers and managers often believe that inventory control is possible only when resources are plentiful. This is not the case. Inventory control is about managing and using the resources available. There will be "sufficient resources" only if effective inventory control is implemented.

Good inventory control makes ordering and pharmaceutical management easier. Essential medicines programs place a high priority on improving inventory control to ensure a reliable supply of essential medicines, vaccines, and other items at health facilities. To achieve this aim, staff need to be trained in inventory control, storage, and ordering procedures.

The choice of an appropriate inventory control method varies according to the type of facility, scale of operations, and staff capabilities. Despite these differences, the principles of effective inventory control remain the same.

46.1 Managing medicines at health facilities

The purpose of inventory control at the facility level is to—

- Prepare effective orders
- Maintain sufficient safety stock levels within budget limits
- Maintain records in accordance with local requirements
- Adjust inventory levels to respond to new morbidity trends and changes in standard treatment guidelines
- Provide appropriate, safe, and secure storage
- Prevent expiry of medicines

HIV/AIDS is changing the picture of pharmaceutical supply management in many facilities because of the lifelong nature of the treatment. However, the ultimate goal of inventory control is to ensure that the right medicines are kept in the right quantities and are available at the right time.

Benefits of a successful inventory control system at the facility level

Maintaining a sufficient stock of items at a health facility has many benefits. Patients receive medicines promptly, and stockouts can be prevented even when deliveries are delayed. Supplies can be replenished at scheduled intervals, saving on administrative costs and transport time. Patients have confidence in the facility and seek help when they are ill. In addition, an effective inventory control system keeps track of and ensures accountability for supplies.

Problems arising from poor stock control

When inventory control fails, problems occur. A patient's condition may worsen or antimicrobial resistance may develop because of a delay in treatment; a patient may even die if a lifesaving medicine is out of stock. If medicines are not available in rural facilities, patients may have to make long and expensive journeys to obtain treatment. If medicine availability at the secondary level is better than at the primary level, the community will lose confidence in primary health care and seek hospital treatment instead. When a medicine is out of stock, a less suitable alternative may be prescribed. Frequent stockouts may establish or reinforce poor prescribing habits. Emergency orders, which are expensive for the purchaser and inconvenient for the supplier, may be required.

Staff commonly resist the implementation of inventory control systems. The reasons should not be ignored but rather brought out into the open for discussion. Common reasons for resistance are a perceived lack of time for record keeping or a feeling that "this is not my job." Lack of appropriate training may also play a major role in resistance to new systems. An advocate on staff can demonstrate that the time spent on inventory management activities is time well

spent. Patients also need to understand that the time health care staff spend to maintain records ensures that their medicines will be available during their next visit.

Cost of maintaining stock

Stocking a new health facility can account for a significant amount of the facility's total annual budget. If stock is managed well, however, future expenses will be consistent with use. An efficient inventory control system saves money. Poor inventory control leads to wastage or increased costs for holding stock—

- Overstocking of certain items may tie up a substantial portion of the pharmaceutical budget, leaving insufficient funds for other important, perhaps life-saving, medicines.
- Overstocked medicines often expire; for example, some antiretrovirals (ARVs) have only a six-month shelf life.
- Poor storage conditions may result in spoiled stock (for example, dressings may be soaked by a leak in the roof, or injectable medicines may lose potency if the storeroom is too hot).
- Poor stock records and poor security make theft easier.
- A change in prescribing policy or practice may make a medicine obsolete. Without good inventory control, such changes may result in excessive wastage.

46.2 Managing the storage area

Good inventory control requires careful thought about the dimensions and design of the storage space, appropriate conditions for storage of different types of supplies, and the importance of stock rotation and systematic arrangement of stock, as well as attention to cleanliness, fire-prevention measures, and security within the store (see Figure 46-1).

Dimensions and design of the store

Storage should be located in a dry, weatherproof building. Stock should be organized and easily accessible on an adequate amount of good-quality shelving (most items in health facilities can be kept on shelves). Space and cold-chain equipment should be provided for the refrigeration of vaccines and other items. Temperature and humidity levels should be controlled within appropriate limits, and the space should be well ventilated. Pharmaceuticals and medical supplies should be segregated from linens, food, and other nonmedical items. The building should be physically secure.

Sizing. Product and packaging innovations, as well as fear of blood-borne infections, such as HIV and hepatitis B, have increased the use of disposable medical sundries. These items require more storage space. In addition, large global funding initiatives, particularly for HIV/AIDS, tuberculosis, and malaria, have dramatically increased the volume of medicines that facilities have to handle. For example, treatment kits, such as those used for tuberculosis, and blister packs of artemisinin-based combination therapies take up much more space than bulk bottles of tablets, for example. Designers of new facilities frequently underestimate storage requirements, and older facilities are often very short of space, with supplies stored in corridors and blocking work areas. Appropriate adjustable shelving and handling equipment are often lacking. Health facilities need to be aware of possible increases in space requirements due to public health program scale-up and plan accordingly.

Hospital stores are more difficult to size because they vary with the range of services offered and the organization of services. Stock levels and lead times also need to be considered in the estimate. However, the general rule is that 1 square meter per hospital bed can be used for initial planning and costing, assuming that supplies are received every month.

Receiving bay. A weather-protected area designated for receiving supplies should be close to the storage area and preferably linked to it by a covered walkway. A pharmacy or medical stores department in a hospital may have its own delivery bay, which is often raised above ground level to facilitate unloading from large delivery vans. Smaller facilities have a single receiving bay providing access to ambulances and small delivery trucks. Designating one area of the actual storeroom as the receiving area may be necessary, if no space exists for a separate receiving bay.

Storage of supplies

Most pharmaceuticals and medical supplies can be kept at uncontrolled room temperature. If the product has no special instructions, normal storage conditions apply. These conditions mean storage in dry, clean, well-ventilated premises at temperatures of +15 to +25°C or, depending on climatic conditions, up to +30°C.

Less stable medicines must be stored in specific conditions to maintain their effectiveness and prevent contamination. Storage instructions are product-specific. Different brands of the same generic drug may have different storage requirements because their packaging or formulation differs slightly. The manufacturer's recommendations should be followed. The expiry date provided by the manufacturer assumes that products are stored under ideal conditions. The following categories of medicines require special storage facilities—

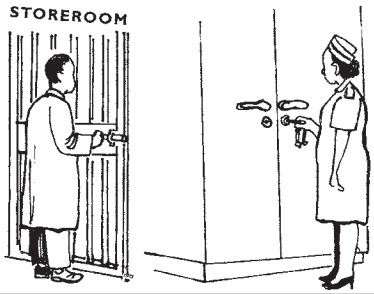
- Products that must be kept frozen (usually vaccines and sera)

Figure 46-1 Tips for managing stock in the pharmaceutical storeroom

Security

Secure the storeroom
- double doors/double locks on entrance
- burglar bars on windows

Use extra precaution for "attractive items"



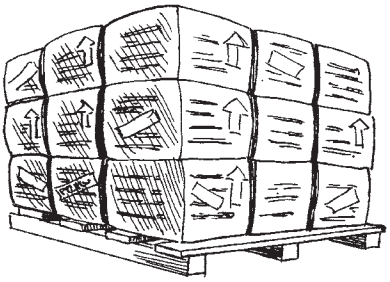
No lockable cupboards?
Then improvise: secure using wire mesh, latch, and padlock

Bulk Storage

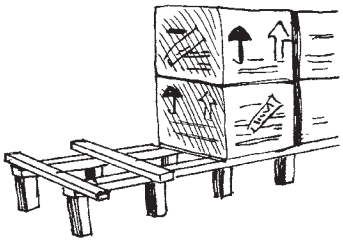
Store bulk off the floor

Allow air circulation

Limit the height of stacks to prevent crushing



No pallets?
Then improvise: construct a wood frame



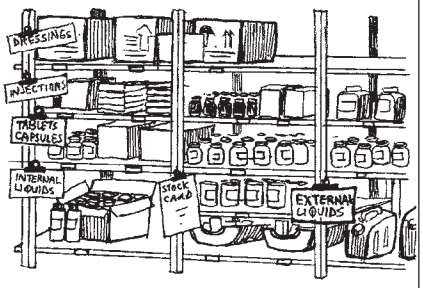
Orderly Arrangement

Provide sufficient shelving

Use a system for arrangement: by order code/ drug category or alphabetic by generic name

Guard against spoilage: lightweight items higher up; heavy fluids, fragile items lower

Arrange neatly and label shelf for each item



No shelves?
Then improvise: support planks with bricks or crates; use strong cartons and other empty containers

Accountability

Restrict access and check stock frequently

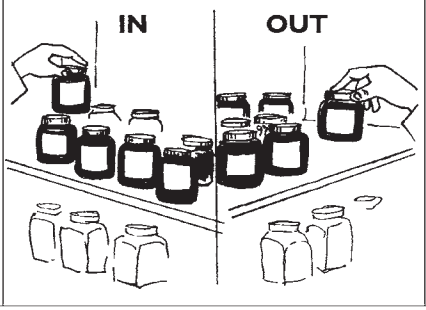
Maintain a stock card for each item if possible
- keep stock card next to item
- fasten stock card to shelf

No stock cards?
Then improvise: make your own or use a book

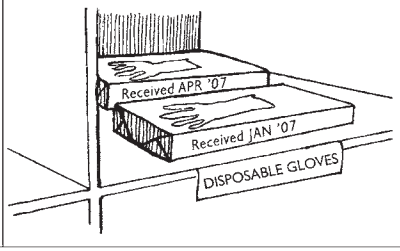
Stock Rotation

When receiving, place containers according to expiry date
- later expiry at back
- earlier expiry at front

When issuing
- take the container with the earliest expiry date



What about items without expiry date?
Use FIFO



- Products sensitive to heat that require refrigeration
- Products that have a reduced shelf life at uncontrolled room temperature and need mechanical ventilation or air-conditioning
- Flammable products that require separate, fireproof premises
- Products prone to theft or misuse (see Chapter 43)

Items needing storage in a controlled environment. The usable shelf life of the following products may be reduced if stored at uncontrolled humidity or at room temperature in hot climates—

- Some injectable products (for example, adrenaline). Most injectable preparations are less stable than solid oral forms (tablets and capsules). Injectable preparations in solution are particularly unstable, whereas freeze-dried powder preparations (for reconstitution) are less degradable. Many injectables require protection from light as well as from heat.
- Some suspensions, such as the ARV stavudine, which has a shorter shelf life than the capsule form.
- Intravenous fluids (particularly if purchased in plastic containers).
- Some suppositories, pessaries, creams, and ointments. These products may melt at temperatures greater than 30°C. If they do melt, they should not be used because the active ingredient in the formula may become unevenly distributed.
- X-ray films and chemicals. Manufacturers typically recommend storage of X-ray film at a maximum of 21°C. Opened packages are also affected by humidity. A humidity range of 30 to 50 percent is advisable. X-ray film should be handled carefully to avoid staining, creasing, buckling, and friction.
- Products containing rubber, latex, cellulose, or some plastics. Condoms, most sterile disposable medical devices, and surgical products such as syringes, needles, and catheters require protection from excessive humidity, cold, and strong light. Any of these conditions may make products brittle, stained, malodorous, and unusable. Sterility cannot be ensured if packaging is damaged.

In hot climates, these items should be stored in the coolest place possible, preferably with air-conditioning or air-circulation fans. When preparing essential medicines lists (see Chapter 16), taking account of the stability of medicines and the type of storage facilities available is important.

Items needing freezing or refrigeration. Vaccines, blood products, and some other medicines lose potency if kept, even briefly, at temperatures outside the recommended range. For those products, the cold chain must be maintained at every stage. (See Table 44-3 and References and Further Readings for literature on cold-chain management.)

All cold-chain equipment should meet WHO standards. Top-loading refrigerators and freezers are the most appropriate choice. Electric refrigerators of the ice-lined type have good "hold-over" characteristics in the event of a power failure. Front-loading types should be used only in places where the electricity or fuel supply is completely reliable, because they have very poor hold-over characteristics and temperature control.

Having a contingency plan in place before a refrigerator breaks down is essential. Rural health facilities are often so small and so isolated that no other source of refrigeration is available. Larger facilities frequently have more than one refrigerator and can use another refrigerator to store vaccines for short periods. Alternatively, an arrangement can be made to move the contents to a private refrigerator elsewhere in the community or to obtain a regular supply of ice packs until the defect is rectified.

Performing routine monitoring and maintenance is also important, as well as organizing an effective repair system. The temperature in each appliance must be monitored and recorded routinely at least once a day. Any breakdown must also be recorded, including the period during which the medicines were exposed to uncontrolled temperatures. Medicines are then kept or discarded, depending on the program guidelines or the manufacturer's advice. Cold-chain monitor cards and devices in or on packages that change color or otherwise alert staff to potential damage assist in monitoring.

Freezing is as damaging as high temperatures for some items, including injectable contraceptives, ergometrine, insulin, adrenaline, and the DPT, DT, TT, and hepatitis B vaccines. Frozen toxoids can be detected by the "shake test" (if the contents clump or fail to resuspend after vigorous shaking). Evidence from Eastern Europe shows that vaccines can freeze inside a refrigerator during winter months when heat in a building is inadequate. Refrigerators incorporating a heating circuit are available to overcome this problem. Loss of potency in ergometrine injection has frequently been found in field studies, and may also be detected visually. If the solution appears colored when compared with water, the injection has less than 90 percent of stated content and should be discarded.

Short periods at room temperature (during transportation or local distribution, for instance) are acceptable for many products (such as ergometrine and insulin), even though such exposure can, to some extent, reduce shelf life. Other items, such as vaccines, should always be transported in cold boxes.

Controlled drugs. Narcotics (for example, pethidine injection, morphine preparations) and other specified medicines that may be abused are governed by special legislation and regulations that control import, export, production,

supply, possession, prescribing, record keeping, and retention of documents.

The following security measures are suggested in the pharmacy and at each user level—

- A safe or reinforced, double-locked cabinet fitted with a light (preferably with a red bulb) that comes on when the door is opened
- A special register recording details of each receipt or issue with two signatures, physical counting after each entry, and signatures at "handover-takeover"
- Independent audit (by supervisors and national pharmaceutical inspectors)

Attractive items. Some noncontrolled items are particularly prone to theft, abuse, or misuse. They include expensive medicines (cimetidine, praziquantel, ARVs); certain antibiotics; psychotropics; equipment such as scissors, safety razors, and hypodermic needles; and sundries, such as rolls of cotton. Such items should be stored in a separate, locked area or cupboard, where they can be supervised.

These items require stricter record keeping and more frequent stock taking than other items. Periodic audits should be made of consumption (issues) against actual recorded use (outpatient registers, prescription records, or ward stock records) to expose any theft or misuse. Embossing packaging or the pharmaceutical products themselves with a unique identifier can deter the diversion of pharmaceuticals into the private sector (see Chapter 19).

Flammables and corrosives. Flammable liquids commonly found in health facilities fall into three categories, according to United Nations hazard classifications—

1. Flash point of –18°C (for example, acetone, anesthetic ether)
2. Flash point of –18 to +23°C (such as alcohols before dilution)
3. Flash point of +23 to +61°C (for example, kerosene)

Bulk supplies of flammable substances require a separate outdoor store located away from the main buildings and pathways. Even small stocks of category-1 flammables should be kept in an outbuilding designed specifically for that purpose (AHRTAG 1994). Firefighting equipment should be readily available.

A small working stock of flammables may be kept in a steel cabinet in well-ventilated premises, away from open flames and electrical appliances. The cabinets should be marked "highly flammable liquid" and bear the international hazard symbol. The cabinet shelves should be designed to contain spillage.

Corrosive or oxidant substances (such as trichloracetic acid, glacial acetic acid, concentrated ammonia solutions, silver nitrate, sodium nitrite, and sodium hydroxide pellets) should be stored away from flammables, ideally in a separate steel cabinet. Appropriate industrial-type protective gloves should be used when handling these substances.

Stock rotation and expiry monitoring

The first-expiry/first-out (FEFO) rule ensures stock rotation and prevents wastage through expiry. In this system, the stock with the longest life should be placed farthest to the back (or, if shelving makes such placement impossible, farthest to the left). Stock should be issued only from the front or from the right-hand side. The expiry dates of medicines should be checked at the time of receipt and noted on the stock record. Stock nearing expiry should not be accepted unless it can be used before expiry. Facilities should regularly monitor expiry dates, and expired medicines should be removed immediately from stock. In most cases, they must be destroyed. There should be an agreed-upon procedure for disposal that protects public health. A written record is necessary, and in some countries, a committee decision is required.

Health professionals sometimes have to decide whether to use an expired medicine or withhold treatment. The medicine may still be usable and could save a life, but an expired medicine might actually kill a patient. Such decisions have ethical and legal consequences. The only legal procedure for using expired medicines is to test them, transmit the test results to the manufacturer, and have the manufacturer extend the expiry date.

No guarantee exists of a medicine's effectiveness after the expiry date. In exceptional circumstances, when expired medicines might have to be used, a pharmacist who is experienced in quality assurance must be involved and the clinician must be informed. Medicines usually expire because they have been overordered or the FEFO rule has not been observed. In well-run stores where orders are placed regularly and stock is rotated, wastage caused by expiry should not occur. When it does, the supervisor should find out why and take corrective action.

Expired or damaged products should be disposed of following written standard procedures that conform to country laws or regulations related to hazardous waste.

Arrangement of stock

Organizing stock systematically saves time when ordering or locating items and prevents stock from being lost. Chapter 44 discusses various systems for organizing stock (see Section 44.5). The systems most often used in health facilities are organization by therapeutic category, clinical indication, or dosage form, with products arranged alphabetically within those categories.

Treatment rooms and medicine trolley carts should arrange medicines by therapeutic class (for example,

antibiotics, antiasthmatics, or antihypertensives) or consistently follow another approved classification.

Liquids for internal use must be kept separate from those for external use throughout the supply chain, but particularly in treatment areas. Products for external use are often poisons. If kept with medicines for oral use, they may be accidentally swallowed, which could be fatal. To avoid risk, observe the following labeling conventions—

- External-use products should be properly labeled according to the country's pharmaceutical control legislation. Warning labels in red are recommended.
- All internal-use medicines should be labeled according to national or local requirements.

Cleaning

A clean, tidy store is easier to manage than one that is dirty, untidy, and filled with waste. A cleaning schedule with clear designation of staff responsibilities should be established.

Fire prevention

Fire-prevention measures should include a strict no-smoking rule, careful disposal of combustible waste materials, and careful handling of flammables. Firefighting equipment should be regularly checked and maintained, and staff members should be trained with regular fire drills.

Security

Access to storage areas should be restricted for security reasons. All staff members who handle supplies should be accountable for their actions. One or two responsible and trustworthy people should be accountable for the keys, and one set should be available on the premises at all times. The person in charge of the health facility is ultimately held responsible.

All storeroom windows should have burglar bars, and doors must be fitted with security locks. Work areas such as the pharmacy or dispensary should have double locks (see Chapter 43).

46.3 Inventory control within health facilities

Every facility needs an inventory management system—and written procedures—to deal with ordering supplies, receiving and storing stocks, and recording and accounting for stocks.

In larger facilities, inventory management requirements are greater. At large hospitals, pharmacists or other specialized staff members usually manage supplies. Separate facilities may exist for the various activities and types of stock. At

smaller facilities, such as health centers, activities tend to be integrated, and a single person may have multiple responsibilities. Even in a small facility, however, stocks of food and linen should be separated from medical supplies to maintain hygiene standards and to allow nonprofessional staff easy access to the food and linen.

Keeping records and ordering stock

Chapter 23 outlines the principles of inventory management, which are equally relevant for small health facilities and large stores. Their application may be different, but the underlying methods are the same.

Keeping records. The most important record is the stock card or ledger. The examples in Chapter 44 (see Annexes 44-1 and 44-2) contain most of the features that are likely to be required, but many variations are possible. At a minimum, space should exist for a description of the item and its stock number, the unit of issue (for example, 500-tablet jar, tablet, or mL), and expiry date, if applicable. Columns and rows to document receipt and issue of stock should appear below this standard information. In addition to the stock card kept next to the items on the shelf, a stock book may be used that maintains a duplicate record of each transaction. Some larger facilities may use a computerized record-keeping system for inventory management.

Ordering stock. Most health facilities use a requisitioning system to order supplies. Staff must assess the rate at which individual items are used and have a clear understanding of the safety stock concept. Various methods of calculating order quantity exist, but all are based on monthly consumption. Monthly consumption can be determined from the stock card or from the monthly stock check.

Various ways of calculating safety stocks and order quantities are described in Chapter 20. One simple system of ordering for health facility use is the imprest, or "topping up," system to the maximum stock level. This system is particularly suitable for hospital wards and small health facilities that receive supplies frequently. In the imprest system, no running stock records are kept. The only stock control document is a preprinted sheet that describes each item and gives its stock number, unit of issue, and imprest level—the recommended maximum stock level for that item. The amount ordered is the difference between the stock on hand and the imprest level.

Another effective system is ordering based on consumption versus maximum stock levels, typified by the approach used in the Eastern Cape Province in South Africa (see Box 46-1).

Box 46-1
Calculating how much stock to order using the maximum stock approach

The maximum stock approach consists of replenishing stock to an optimal maximum stock level every time an order comes in. Determining the maximum stock factor can simplify the calculation. The maximum stock factor varies with the frequency of orders and the lead time, according to the following table. The lead time and the order frequency are known from experience (or from an order schedule).

Maximum stock factor table

Order frequency	Lead time			
	1 Week	2 Weeks	4 Weeks	6 Weeks
Once a week	0.05	1		
Every 2 weeks	1	1	2	
Once a month	1.5	2	3	4
Every 6 weeks	2	3	4	5
Every 2 months	3	4	5	6
Every 3 months	4	5	6	7

To identify the maximum stock factor, one should draw two imaginary lines: one horizontal line on the corresponding order frequency row and one vertical line on the lead-time column. The meeting point of those two lines indicates the maximum stock factor. For example, if supplies are ordered once a month and the lead time from the source is equal to four weeks (or one month), then the maximum stock factor is equal to three.

After the maximum stock factor is identified, the next step is calculating the maximum stock using the following formula—

Maximum stock (in issue units) =
average monthly consumption × maximum stock factor

The next step is comparing this maximum stock to the current stock balance of usable stock (without any expired items)—

- If the current stock balance is greater than or equal to the maximum stock, no order needs to be placed.
- If the current stock balance is smaller than the maximum stock, then an order must be placed unless the product is discontinued or its use is influenced by some external factors, such as the end of a season, the end of a public health campaign, or modification of the essential medicines list.

After the reorder factor is identified, the next step is calculating the quantity to order using the following formula—

Quantity to order (in issue units) =
maximum stock – stock on hand

Note: If the result is too small (not enough needed to place an order), an order might be placed only on the next scheduled date. In some cases, if the demand for this product is related to a particular season and the season is over, the quantity to order is decreased or nothing is ordered.

These formulas should only be used as guidelines in estimating order quantities. A modification to any one of the components of the procurement cycle (time of delivery, expiration date, disease outbreak, new physician, and so on) will influence the entire system. The requisitioning officer's individual experience as well as the nature of each product are essential considerations in arriving at a final decision.

Example

Product A's average monthly consumption equals 45 units. This product is ordered every two weeks, and the lead time is equal to four weeks. The current stock is 60 units. If an order has to be placed, how much has to be ordered?

1. The maximum stock factor has to be calculated. In this case, it is equal to two. Therefore, the maximum stock is equal to 90. The current stock balance is 60, so an order has to be placed.
2. The quantity to order is calculated using the recommended formula—

Quantity to order =
90 (maximum stock) – 60 (stock on hand) = 30

Source: Eastern Cape Department of Health 2000.

After the order quantity is calculated, orders are sent to the issuing store on a requisition/issue voucher (see Annex 44-4). The facility and the issuing store should always keep copies of the requisition voucher or imprest forms. Those forms should be compared to the stock cards to monitor consumption and prevent overordering.

Receiving stock

A clear procedure for receiving stock should be in place. If goods are not checked into the store on arrival, chaos occurs. The person in charge should be responsible, whether or not he or she personally undertakes the task.

All deliveries should be formally received, whether they arrive inside or outside normal working hours. The number of packages delivered should be noted in a register and signed for by both the person receiving and the person delivering the goods.

Unpacking and checking stock

Supplies should be unpacked and checked next to the storage area, which may also be used for assembling stock for distribution. Two people should perform these activities, to provide a witness in case supplies are damaged or differ in type or quantity from what was ordered (or from what is shown on the packing list). Supplies should be individually checked using a checklist like the one in Chapter 44 and their receipt recorded on the supply documents (packing list or returned requisition form). The copy of the original requisition form should always be compared with documents from the issuing facility to prevent later disputes.

The issuing store should be notified of any discrepancies (using a form like the one in Figure 46-2), including—

- Missing boxes or cartons
- Open boxes or cartons
- Missing items
- Quantity different from the one shown on the packing list
- Wrong items (items not ordered)
- Damaged, broken, or poor-quality items

Staff members should see checking not simply as counting the units delivered but as part of the quality assurance system. This process includes visually inspecting the packaging, the integrity of containers, and the completeness and legibility of labels (approved medicine name, strength, any special storage instructions, expiry date). The expiry date should be checked to ensure that adequate shelf life remains (see Chapter 19).

Packaging is an important factor in maintaining the quality of medicines and other supplies when stability is a consideration. Good packaging protects the product from light and air. Packaging should be removed only after careful consideration of the effect on pharmaceutical quality.

Finally, the delivery documents should be signed and filed for reference; they should usually be kept for a minimum of two years (or the time specified in regulations).

46.4 Distributing stock from the storeroom

Medicines and supplies need to be moved from the facility store to the places where they are used, such as treatment areas, wards, or outpatient facilities. The procedures are similar, whatever the size of the facility.

Small health facilities

Small facilities may not have a separate pharmacy, but they should have a medicine storeroom or cupboard and a dispensing and treatment area. A working stock (often a single container) of common medications should be kept in the treatment area. Oral medication should be stored in a lockable trolley cart or cupboard. A small stock of common injectable medicines should be kept on a tray in the treatment room. A separate area usually exists for cleaning and dressing wounds, where an appropriate range of items should be kept on trolley carts and in lockable cupboards. These working stocks are replenished from the storeroom daily. Working-stock containers must be kept closed except when they are actually being used, to avoid deterioration and loss of therapeutic value.

Hospital pharmacy departments

The movement and control of stocks are more complex in larger facilities where medical, surgical, and maternity care are provided. Each type of ward should have its own stock list to facilitate control and misuse, and separate storerooms may be needed. The hospital pharmacy should be responsible for restocking all medicine storage areas and may also dispense to individual inpatients and outpatients. The volume of outpatient prescriptions may justify an outpatient dispensary separate from the main pharmacy.

As HIV/AIDS programs scale up, one option for hospitals that offer antiretroviral therapy is to refer established patients to local health facilities for their medications, which reduces the time and cost of travel for patients. Country Study 46-1 shows how a South African hospital has expanded its system to include other patients with chronic health conditions.

The hospital pharmacy may have working stock from which it dispenses medications to inpatients, and upon their discharge, to outpatients, and to wards, departments, and emergency trays. A "want list" should be compiled throughout the day, for daily replenishment from the storeroom.

Figure 46-2 Discrepancy report

Ministry of Health
Department of Medical Supply
DISCREPANCY REPORT

Health facility: Utano HC
Date: Mar 26, 2008
1. Received by: Tinoda SRN
No. of cartons received: 3
2. Witnessed by: Jayuguru SRN
No. of other containers received: 1

DETAILS OF SHIPMENT

3. Issue voucher no./s: 98570
4. Transporter: DMS Driver
Vehicle reg. no.: 25TCE176
5. Name of driver: Mugari
Transporter shipment note: MUG65
6. List of cartons rcvd.: 3 cartons
List of cartons not rcvd.: 1 container 5 Liter

DETAILS OF DISCREPANCIES

7. Breakages (if any):

Issue voucher no.	Item Description	Code No.	Unit	Quantity Broken
98570	Chloroquine syrup	03-2500	Bottle 500 mL	2

8. Items missing:

Issue voucher no.	Item Description	Code No.	Unit	Quantity Missing
98570	Chlorhexidine solution 2%	04-1650	5 Liter	1

9. Items issued in error:

Issue voucher no.	Item Description	Code No.	Unit	Quantity Tampered With

10. Any other discrepancies/comments:

PLEASE CREDIT BREAKAGES AND RESUPPLY ANY MISSING ITEMS

11. Signature: Tinoda (TINODA)
Office held: SRN

Country Study 46-1
Improving treatment for chronic conditions with a computerized referral system in South Africa

Cecilia Makiwane Hospital is located in Mdantsane, Eastern Cape Province, one of the largest townships in South Africa. The hospital implemented the national *Comprehensive Plan for the Treatment and Care of HIV and AIDS* in October 2004, and a year later, more than 800 patients had been enrolled on antiretroviral therapy (ART). All patients collect their medication regularly at the hospital; after a patient has been stabilized and the patient demonstrates his or her ability to adhere to treatment, the doctor prescribes a repeat of the medication for five months. However, frequent trips to the hospital can be a burden. In some cases, patients may pay as much as 120 South African rands (19 U.S. dollars) for transportation to pick up their medication. This expense strains patients' already low income and can affect treatment adherence. Furthermore, these patients can overburden the hospital's pharmaceutical service, where staff also need to deal with new or complicated cases on a daily basis.

To maximize patients' access to ART, Management Sciences for Health's Rational Pharmaceutical Management Plus (RPM Plus) Program looked at innovative approaches for dispensing repeat prescriptions to established patients. The result is a fully integrated computerized program, RxSolution, designed to support pharmaceutical care activities at the facility level. RxSolution includes a referral module that optimizes dispensing of chronic medicines by shifting ART care to primary health care facilities in the local communities.

In collaboration with the provincial pharmacy team, RPM Plus staff visited all community referral clinics to ensure that the conditions and facilities required to deliver high-quality and safe medications were in place. As one of the clinic nurses said, "We also had to ensure that not a single client misses a single dose as that would affect treatment outcomes."

After receiving training on the computer system, the pharmacy staff of the Cecilia Makiwane Hospital record patient details in the RxSolution database. As stable ART patients are recruited into the program, they are given appointment cards with the date of their next visit and told at which referral clinic to collect their medication. Using RxSolution, hospital staff members group all prescriptions by referral clinic and create a prescription pick list, a set of medication and address labels, and a patient accountability checklist. Prescriptions are checked, packaged in cartons, sealed, grouped according to the referral clinics, and dispatched by courier.

At the referral clinic, the nurse signs the distribution list, which is returned to the hospital. During scheduled patient visits, the nurse reviews progress and gives medications to the patient, with both the nurse and the patient signing that this interaction has taken place. The list is then returned to the hospital along with any uncollected medication. The hospital staff uses this information to monitor the patient adherence at each referral clinic. During the last visit at the referral clinic, the patient is reminded of his or her next clinical assessment at the hospital.

Referring patients from hospitals to primary health care facilities has always been a challenge. Although the RxSolution system was developed to support patients on ART, it has successfully been extended to other chronic conditions, thereby strengthening the delivery of quality health care to all levels.

This responsibility should rest with a limited number of individuals on a rotational basis.

Prepacking for outpatient dispensing. To save time for both staff and patients in busy facilities with high prescription volumes, prepacking commonly dispensed oral medications in appropriate quantities for standard treatment courses is useful. This packing can be done at quiet times of the day or week. Prepacking is also necessary when quantities smaller than the original pack are needed for ward stocks (see Chapters 30 and 45). In some countries, purchasing commonly used medicines commercially prepacked in "unit-of-use" (course-of-therapy) containers may be cost-effective. Important considerations when repacking medicines are to—

- Use containers suited for maintaining pharmaceutical quality.
- Avoid contaminating or mixing different batches of medicines.
- Label containers appropriately and assign a new "use-by" date.

Supplying inpatients. As discussed in Chapter 45, three basic techniques exist for hospital pharmaceutical distribution to inpatients: bulk ward stock, individual medicine orders, and unit-dose distribution. The bulk ward stock system is still used in many countries. The imprest or topping-up system is a common method for supplying wards with bulk stock. Empty containers are returned for refilling (the

"full-for-empty" method) at weekly or twice-weekly intervals. Each ward should have a box that can be locked by both pharmacy and ward staff. Stricter security procedures should be applied for antibiotics, "attractive items," and narcotic drugs.

In a ward stock system, the pharmacy should provide a schedule indicating on which day each ward or department is to be supplied and specifying the category of supplies. Pharmacy, stores, and ward staff must decide together about the types and quantities of medicines required, and pharmacy staff members must monitor ward stock storage and record keeping.

Emergency trays. A selection of medicines and equipment for emergencies should be placed in wards and outpatient departments. The contents should be recorded on a list and checked regularly. Whenever an item is used, it should be restocked immediately. The emergency tray should not be used for routine supplies. Box 46-2 is an example of an emergency tray at a health post in Timor-Leste.

Supplying community-based health workers. Community health workers usually have a very limited selection of items. The topping-up system can be used to replenish stocks as long as requirements are small and the health center is reliably stocked. A monthly supply interval is usually adequate.

Home-based care kits. The family is usually the source of long-term care for chronic conditions such as HIV/AIDS and tuberculosis. Home-based care kits can be supplied to community health workers to distribute to caregivers. Kits should be designed according to the individual condition, but at a minimum should contain appropriate essential medicines, such as painkillers and antidiarrheals, as well as supplies such as gloves, soap, and disinfectant. Basic care information written in local languages and using diagrams and drawings should be included. The kit contents should be restocked from the supplies at dispensaries and health centers.

46.5 Staff training

Staff members who handle supplies should be trained in the following subjects—

- Setting up a storeroom and good storage practices
- Use of stock control forms, including requisitions, stock records, and prescriptions
- Cold-chain procedures, including the use and maintenance of refrigerators
- Security and theft control

Chapter 52 discusses the design and management of appropriate training programs for supply system staff and resources for available courses. ■

Box 46-2
Medicines for an emergency tray at a health post

Ampicillin powder for injection, 1 g (as sodium salt) in vial

Atropine injection, 1 mg (sulfate) in 1 mL ampoule

Calcium gluconate injection, 100 mg/mL in 10 mL ampoule

Charcoal, activated powder for oral suspension, bottle, 50 g

Chloramphenicol powder for injection, 1 g (sodium succinate) in vial

Diazepam injection, 5 mg/mL in 2 mL ampoule (intravenous or rectal)

Epinephrine/adrenaline injection, 1 mg (as hydrochloride or hydrogen tartrate) in 1 mL ampoule

Ergometrine injection, 200 µg (hydrogen maleate) in 1 mL ampoule

Gentamicin injection, 40 mg (as sulfate)/mL in 2 mL vial

Glucose injectable solution, 5% in 1 L bag

Glucose injectable solution, 50% hypertonic

Hydrocortisone powder for injection, 100 mg (as sodium succinate) in vial

Phytomenadione (vitamin K1) injection, 10 mg/mL in 1 mL ampoule (adult)

Promethazine injection, 25 mg (as hydrochloride)/mL in 2 mL ampoule

Magnesium sulfate injection, 500 mg/mL in 10 mL ampoule for use in eclampsia and severe preeclampsia and not for other convulsant disorders; available for trained midwives

Magnesium sulfate powder

Nifedipine scored tablet, 10 mg

Quinine injection, 300 mg (as dihydrochloride)/mL in 2 mL ampoule

Salbutamol injection, 50 µg (as sulfate)/mL in 5 mL ampoule

Sodium lactate, compound solution injectable solution, 1 L bag

Source: Timor-Leste Ministry of Health 2004.

ASSESSMENT GUIDE

See Chapter 23 for indicators of stock control performance. Also, see Annex 46-1 for a supervisory checklist to assess pharmaceutical management activities at the facility level.

Inventory control system

- Is there a standard inventory control system at health facilities?
- Are stock cards or stock books used for every movement of stock in or out of the facility storeroom?
- Are pharmaceuticals reordered according to a consumption-based system?
- Is the minimum or safety stock level set according to the frequency of delivery and average consumption?
- Are used stock cards, ledgers, or regulation books kept for a defined period?
- Do stock records correspond with physical stock for a sample of commonly used medicines?

Staff training in inventory management

- Have the staff responsible for ordering, storing, or distributing pharmaceuticals been formally trained in inventory management?
- Are procedures manuals for inventory management available in the health facility?

Stock storage facilities

- Have the stock storerooms been sized according to any formula?
- Will public health program expansion create a need for more storage space?
- Is there a receiving area? Is there an unpacking area?
- Is there a discrepancy report form? Over the past year, has it been used?
- Is the storeroom dry, clean, well ventilated, and between +15 and +25°C?
- Is there a refrigerator? Is its temperature regularly recorded?

Storeroom management

- When medicines or supplies are unpacked, are they stored according to FEFO or FIFO order?
- Over the past year, have expired medicines been used?
- Are there expired drugs in stock now?
- Are liquids for internal use kept separate from liquids for external use?

References and further readings

★ = Key readings.

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Annex 46-1 Supervisory checklist to assess pharmaceutical management activities at the facility level

CLINIC: _____ DATE: _____

Infrastructure conditions: How does your store match up to the ideal store?	**[✓] Check if statement is TRUE**
• The store is separate from the dispensary.	
• Medicines are dispensed only from the dispensing area.	
• The store is large enough to keep all supplies.	
• The store is kept locked at all times when not in use.	
• The store has no cracks, holes, or sign of water damage.	
• The store has a ceiling that is in good condition.	
• Air moves freely in the store; fans and screens are in good condition.	
• The windows are painted in white (or have curtains) and are secured with grilles.	
• There are no signs of pest infestations in the store (e.g., cockroaches, rats).	
• The store is tidy; shelves are dusted, the floor is swept, and walls are clean.	
• Supplies are stored neatly on shelves or in boxes.	
• Shelves and boxes are raised off the floor, on pallets or on boards and bricks.	
• No supplies are in direct contact with the floor.	

Storage procedures: How well is your store organized?	
• Supplies are systematically classified on the shelves (i.e., by dosage forms or therapeutic class).	
• Supplies are arranged on the shelves in alphabetical order by generic name within each category.	
• Tablets and other dry medicines (e.g., ORS) are stored in airtight containers.	
• Liquids, ointments, and injectables are stored on the middle shelves.	
• Supplies, such as surgical items, condoms, and bandages, are stored on the bottom shelves.	
• Items are grouped in amounts that are easy to count.	
• No expired medicines are in the store.	
• Medicines with shorter expiry dates are placed in front of those with later expiry dates (FEFO).	
• Supplies with no expiry or manufacture date are stored in the order received (FIFO).	
• Supplies with a manufacture date only are stored in chronological order.	
• No damaged containers or packages are on the shelves.	
• No overstocked or obsolete items are on the shelves.	
• The disposal of medicines is recorded in a separate register and includes the date, time, witness, value, quantities, and reason(s).	
• Narcotics and psychotropic drugs are in a separate, double-locked storage space.	
• Items are checked regularly for potential deterioration (i.e., bad odor or discolored tablets).	
• Temperature-sensitive items are stored in a refrigerator.	
• The refrigerator is in working condition.	
• No staff food is in the refrigerator.	
• A temperature record is available and up-to-date.	

Stock card: How are the stock cards used in your facility?		
• Does each item in the store have a stock card?	Y	N
• Is the stock card kept on the same shelf as the item?	Y	N
• Is all information on the stock card up-to-date?	Y	N
• Is information recorded on the stock card at the time of movement?	Y	N
• Is an accurate running tally kept in the **balance** column?	Y	N
• Does the physical count match the balance column? (Check 10 items.)	Y	N
• Is a physical count made at regular intervals, such as once a month?	Y	N

CLINIC: _____ DATE: _____

Ordering supplies: If delivery schedule changes

• How often do you place an order?		
• What is your average lead time?		
• What is your facility's reorder factor?		
• Do you know how to calculate the Average Monthly Consumption (AMC)? Ask/check formula.	Y	N
• Do you take into consideration stockout period when calculating the AMC?	Y	N
• Do you calculate the Maximum Stock by multiplying the AMC by the Maximum Stock Factor?	Y	N
• Has the Maximum Stock been calculated for each item in the store?	Y	N
• Is the Maximum Stock recorded on each item's stock card (in pencil)?	Y	N
• When was the last time that the Maximum Stock was reviewed?		
• When you order, do you use the Quantity to Order formula? Ask/check formula.	Y	N
• Is a standard order form used at all times?	Y	N
• Is the order costed?	Y	N
• Is the requisition book kept at the facility?	Y	N
• Is all information on the requisition form accurate and clearly written?	Y	N

Receiving supplies: How are supplies received at your store?

• Are deliveries received by a health worker in person?	Y	N
• Are deliveries inspected by a health worker before acceptance?	Y	N
• Are supplies received checked against the items listed on the packing slip/delivery form?	Y	N
• Are deliveries acknowledged and recorded on the prescribed forms?	Y	N
• Does the delivery person sign the form before he leaves the facility?	Y	N
• Have you ever sent back items to the supplier? If so, ask for the reason.		
• Are the expiry dates of all items checked before final acceptance?	Y	N
• Does the health worker check for poor-quality items, such as		
- poorly packaged refrigerated items?	Y	N
- discoloration of medicines, vaccines, and suspicious product settlement?	Y	N
- broken containers and supplies spoiled by leakage?	Y	N
- unsealed and unlabeled items?	Y	N
• As soon as the supplies are checked, are all receipts recorded on the stock cards?	Y	N
• If poor-quality products are suspected, does the health worker check for		
- unusual odors of tablets and capsules?	Y	N
- damaged containers?	Y	N
- injectables with small particles that reflect light?	Y	N
- suspension with broken glass?	Y	N
• Do you accept expired or short date or poor-quality items?	Y	N
• Are all discrepancies documented?	Y	N