



Principles of Drug Management

Learning Objectives

At the end of the session, the learner should be able to:

- Discuss the importance of managing drugs
- Identify main elements of the drug management cycle

Medicine is an important health resource. It does not only save lives and improve health. It also promotes trust and participation in health services. Medicine supply management therefore is critical in any health facility.

NOTE:

For the purpose of this manual, the terms “drugs” and “medicines” are used interchangeably.

Three reasons can be given to explain why medicines need to be managed properly. Firstly, medicines are part of the link between the patient and health services. Consequently, their availability or absence will contribute to the positive or negative impact on health. Secondly, poor medicine management, specifically in the public sector of developing countries such as the Philippines, is a critical issue, but major improvements are possible that can save money and improve access.



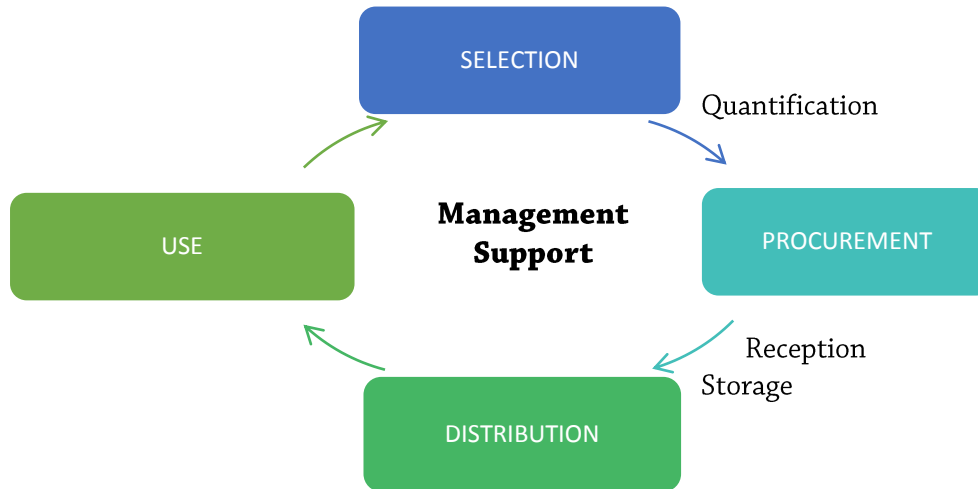
Finally, drugs are no longer the responsibility of health professionals only. Political, economic, financial and traditional considerations have become so crucial in healthcare that it has become imperative to look at medicines and healthcare from these perspectives. All of these factors contribute to appropriate financial expenditure, prevention of wastage, increased access and proper use of medicines.



DRUG MANAGEMENT CYCLE

1

There are four principal phases in medicine management, which are interlinked and reinforced by appropriate management support systems. The following figure illustrates drug management cycle.



Policy and Legal Framework

Figure 1.1. Drug management cycle

Source: Managing Access to Medicines and Health Technologies, 2012

1

DRUG MANAGEMENT CYCLE

Medicines are selected based on pre-determined criteria. After determination of the quantities required, the selected medicines go through a procurement process. Medicines are then delivered to the procuring entity and distributed to the different health facilities. Finally the use of medicines requires prescribing, packaging, dispensing and counseling. These tasks require qualified health personnel with adequate knowledge, appropriate skills and right attitude. Management support tools are important for the acquisition of relevant skills in drug management within a given legal and policy framework.



DRUG MANAGEMENT CYCLE

1

Quality is built into a medicine during its design, development and manufacture. This is the primary responsibility of the manufacturers by following Good Manufacturing Practices (GMP). Quality of medicines must be maintained when it leaves the manufacturer's premises.



In each phase of the drug management cycle, the quality of the product must be ensured through proper storage, transport, distribution, dispensing and use by the people responsible in each phase such as distributors, procurement agencies, dispensers and users.

For numbers 3 to 5, write T if the statement is true and F if the statement is false.

1. Give the four (4) phases of the drug management cycle.
2. Give the meaning of GMP.
3. Quality of medicine is the sole responsibility of the manufacturer.
4. Poor management of medicines leads to poor quality of health care.
5. Medicine promotes trust and participation in health services.

MANAGEMENT SCIENCES FOR HEALTH, INC. 2012. *Managing Access to Medicines and Health Technologies*. [online]. [Accessed 10 November 2014]. Available from:
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<<http://apps.who.int/medicinedocs/en/d/Js7919e/>>

Selection of Medicines



Learning Objectives

At the end of the session, the learner should be able to:

- Explain the medicine selection process
- Discuss the criteria used in medicine selection

Medicines comprise as much as 40% of the health care budget in the developing countries like the Philippines, yet a significant proportion of the population still lack access. With limited financial resources and rising costs of medicines, its selection must be managed appropriately and efficiently. The World Health Organization (WHO) suggests the use of an essential medicines list to manage the selection of medicines.

Essential medicines are those that satisfy the needs of the majority of the population and therefore should be available at all times. The selection and use of a limited number of essential medicines lead to an improved supply of medicines, more rational prescribing and lower costs.



In the Philippines, the essential medicines list is incorporated in the Philippine National Formulary (PNF) Manual, formerly known as the Philippine National Drug Formulary (PNDF). The Department of Health (DOH), through the Formulary Executive Council (FEC), determines the types of drugs and dosage forms to be included in the formulary. This formulary lists the medicines that are considered as most essential for the diseases and conditions encountered in the country. It also describes the appropriate use of these essential medicines. It is periodically reviewed to ensure that it will incorporate significant and new therapeutic advances and information. The criteria for inclusion of medicines into the formulary include the following:

- Relevance to disease
- Efficacy and safety
- Quality
- Cost
- Appropriateness to the capability of health workers at different levels of health care
- Local health problems
- Benefit/ risk ratio

The PNF serves as basis for selection of medicines in a government health facility such as the hospital. However, the hospitals can create their own hospital formulary. Executive Order (EO) 49 s. 1993 states that only medicines listed in the PNF shall be procured by all government entities. Requests for exemptions will be considered provided that the medicine proposed for exemption is of proven efficacy and safety. There should be a simultaneous application filed by the proponent for inclusion of the medicine in the PNF.

The application for exemption shall have the following as attached documents:

- a. Justification for the request;
- b. Scientific evidence of the medicine's efficacy and safety supported with literature;
- c. Report on the disease burden and its ranking relative to the common diseases seen in the community or health facility;

- d. A comparison of costs for the total regimen of the medicine or its full course of therapy with other comparable medicines listed in the current edition of the PNF Manual; and
- e. Copy of Certificate of Product Registration from the Food and Drug Administration (FDA) or proof that the medicine has conformed with the WHO Certification Scheme on Quality of Pharmaceutical Products Moving in International Commerce.

The justification for the request for exemption will include the following:

- a. The medicine will be used for a national health program;
- b. The medicine will be used for a current or potential urgent health situation, where urgent is defined as requiring immediate action to prevent death, permanent disability or a major or irreversible organ dysfunction;

- c. The medicine is needed for the prevention and treatment of priority conditions not yet covered in the existing list;
- d. The medicine is more effective and/or less toxic than a medicine listed for the same indication; and
- e. The medicine is at least as effective and safe and of lower cost than a medicine listed for the same indication.

The Program Director of National Center for Pharmaceutical Access and Management (NCPAM) shall approve or disapprove the request based on the recommendation of FEC. Validity of the exemption is for a period of one year, unless an adverse decision has been rendered regarding the application for inclusion.

The international non-proprietary names (INN) or the generic names of the medicines are used in the PNF and should likewise be used in selecting medicines for inclusion into the hospital. This is also in compliance with the Republic Act (RA) 6675 or the Generic Drugs Act. The generic name is the medicine's official name, regardless of what company or organization manufactures or markets it. A proprietary, commercial, trade or brand name is chosen by the manufacturer to facilitate recognition and association of the product with a particular firm for marketing purposes. For many medicines, there are several branded products that share the same generic name.

The use of generic names in medicine selection and eventually procurement and prescribing offers the following advantages:

- Generic names are more informative and facilitate purchase of products from multiple suppliers;
- There is easy recognition of the type of medicine;
- Generic prescribing facilitates product substitution whenever appropriate; and
- The confusion associated with the use of brand names can be avoided.

Table 2.1. Examples of generic medicines and some of their brand names

Generic Names	Brand Names
Diphenhydramine	Benadryl©
Salbutamol	Ventolin©, Asmalin©
Amoxicillin	Himox©, Moxillin©, Amoxil©
Ciprofloxacin	Cipro©, Ciprobay©
Cotrimoxazole	Bactrim©
Amlodipine	Amvasc©, Norvasc©, Vasalat©

PHARMACY AND THERAPEUTICS COMMITTEE

The Pharmacy and Therapeutics Committee (PTC) is the drug selection committee in the hospitals. It is often the same as the Formulary Committee. An effective PTC requires that members participate in meetings and assist with other committee activities. The members include doctors, pharmacists, nurses, hospital administrators, quality assurance staff, and others as appropriate. A doctor chairs the committee, and a pharmacist serves as secretary.

The PTC should have broad representation but must be sufficiently small and manageable to conduct activity efficiently. The PTC may occasionally invite a specialist to make a presentation or provide advice on a particular issue. PTCs often have subcommittees to address particular issues.



The PTC is responsible for developing relevant policies and procedures for drug selection, procurement, distribution, and use to promote rational drug use. Its functions include:

- Management of the approved hospital formulary;
- Ongoing drug use review;
- Adverse drug event reporting and implementation of safe drug practices; and
- Implementation of safe drug practices.

The PTC is also responsible for developing, managing, updating, and administering a formulary system. A formulary system is part of the drug selection process. It encompasses the whole system for developing, updating, and promoting the formulary list.

A fully developed formulary system usually includes the following:

- formulary list;
- formulary manual;
- regular newsletter or bulletins;
- guidelines for the use of non-formulary medicines; and
- methods for evaluating the need for changes in the list or manual.

REVIEW QUESTIONS

2

For numbers 1 to 3, write T if the statement is true and F if the statement is false.

1. The use of the PNF as basis for the selection of medicines in government hospitals is voluntary.
2. Cost should be the primary criterion considered in the inclusion of medicines in any health facility.
3. The use of generic names facilitates purchase from multiple sources thus leading to a more competitive price.

For numbers 4 to 5, write the letter of the best answer.

4. The following are justifiable reasons for selection of medicines outside the PNDF except:
 - a) The drug is needed for prevention of a condition but not yet listed in the PNDF.

- b) The drug is more effective than the one listed in the formulary.
 - c) The drug is a novel drug product which has recently been launched in the market.
 - d) None of the above.
5. The following are criteria for inclusion of a drug into the PNF except:
- a) Local health problems
 - b) Quality
 - c) Safety
 - d) None of the above

GOVERNMENT PROCUREMENT POLICY BOARD. nd. *Manual of Procedure for the Procurement of Goods*. [online]. [Accessed 11 November 2014]. Available from: <<http://www.gppb.gov.ph/downloadables/forms/GPM%20-%20Vol.2.pdf>>

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Procurement of Medicines



Learning Objectives

At the end of the session the learner should be able to:

- Discuss the medicine procurement process
- Calculate order quantities and request indicator for procurement
- Identify components of medicine requisition form and delivery form
- Describe procedure of receipt of medicines in the hospital and detection of discrepancies in supplies/orders

After selecting medicines appropriate for the hospital, the procurement process commences. The RA 9184, otherwise known as the “Government Procurement Reform Act” defines procurement as the acquisition of goods, consulting services and the contracting for infrastructure projects by the procuring entity. This policy governs the procurement process in all government entities in the country.

A procurement system must be effective and efficient in order to ensure that the correct medicines of good quality are obtained at the right time, in the required quantities and at favorable costs. The procurement process consists of a series of steps (Figure 3.1).

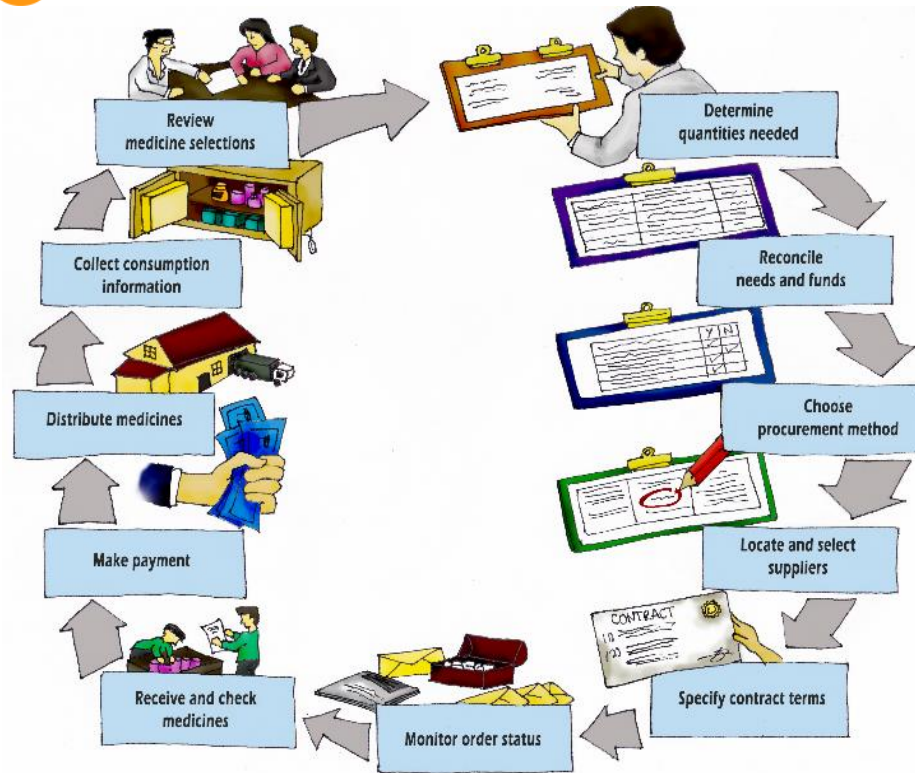


Figure 3.1. Medicine procurement process

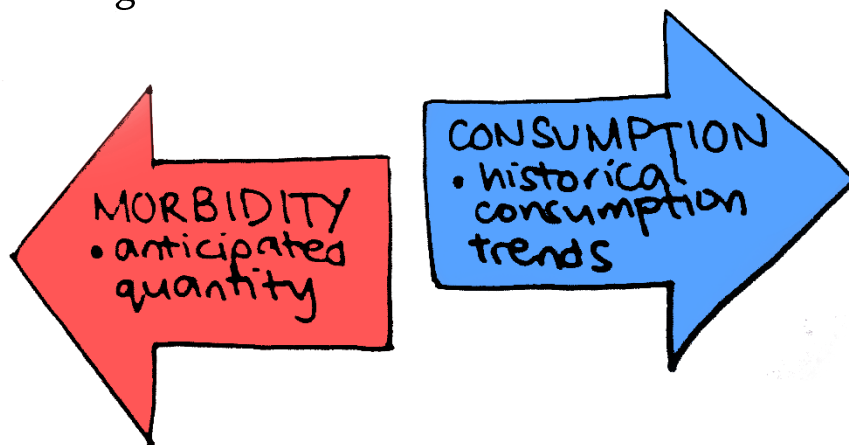
Source: Managing Access to Medicines and Health Technologies, 2012

QUANTIFICATION

Quantification is the process of determining the estimated quantity of a needed product for a specific period of time based on a set of assumptions. It likewise includes the estimation of the financial means required for purchasing the item. The objectives of quantification are:

- Determine rational quantities of products to be procured;
- Avoid stockout and ensure continuous availability;
- Avoid overstock and wastage due to expiry;
- Make the best use of resources and budgets;
- Provide data on specific products use; and
- Calculate emergency needs for disaster relief and/ or epidemics.

The two most common methods for quantifying product requirements are the morbidity and consumption methods. Morbidity method forecasts the anticipated quantity of medicines needed to treat an expected number of cases for specific diseases based on incidence data. Consumption, on the other hand is based on past consumptions of every item. It involves analysis of historical consumption trends and assumptions about factors that may influence the demand in the future. Boxes 3.1 and 3.2 outline the steps in quantification of requirements using the two methods.



Box 3.1. Quantification of drug requirements using morbidity method**Morbidity Method**

1. Specify list of problems encountered in the locality. Consider only those that are according to diagnostic capacity.
2. Establish list of medicines to be quantified. List down essential medicines that cover the major health problems.
3. Establish standard or average treatments. Using standard treatment guidelines, compute for the standard or average treatment regimens for each health problem. (Q_E)

$$Q_E = D_{CU} \times N_D \times L_D$$

4. Collect morbidity data for each health problem. Estimate the expected number of treatment episodes for each health problem from step 1. (C_E)

$$C_E = C + (C \times A_U)$$

Box 3.1. Quantification of drug requirements using morbidity method (cont.)

5. Calculate the number of treatment episodes for each health problem. (E_T)

$$E_T = C_E \times F$$

6. Calculate the quantity of medicines needed for each health problem. (Q_T)

$$Q_T = E_T \times Q_E \times P_T$$

D_{CU} = Basic units per dose; N_D = Number of Doses per day; L_D = length of treatment in days; C = Past total number of contacts; A_U = Utilization adjustment; C_E = Expected total number of contacts; F = Frequency of health problem (per thousand); E_T = Expected treatment episodes; Q_T = Total quantity required; P_T = Percentage of cases expected to be treated

Box 3.1. Quantification of drug requirements using morbidity method (cont.)

Example:

	age group	episode/ 1000	past year estimated # of episodes	projected # of episodes	# of regimen	% cases treated w/ regimen	drug product	basic unit	basic unit/ dose	dose/ day	# of days	basic units/ episode	Q _T
gastritis, heartburn	<5	11	34,537	36,955	1	100%	antacid susp	mL	5	4	5	100	3,695,459
	>5	77	240,502	257,337	1	70%	antacid susp	mL	10	4	5	200	36,027,200
					2	30%	cimetidine 300mg tablet	tablet	1	4	5	20	1,544,023

Box 3.2. Quantification of drug requirements using consumption method

Consumption Method

1. Prepare list of medicines to be quantified.
2. Determine data on the following:
 - Past consumption for each of the medicines in the list (at least 3 months)
 - Number of days of stockout
 - Losses
 - Inventory
3. Calculate average monthly consumption as:
 - Average monthly consumption, $AMC = \text{Consumption} / \text{number of months of consumption}$
4. Calculate the quantity of each medicine required in the next procurement period.
 - Quantity to order, $Q_o = \text{number of months to cover} \times AMC - \text{remaining stock}$

Box 3.2. Quantification of drug requirements using consumption method (cont.)*Example Consumption Method*

Data of monthly consumption of paracetamol 500-mg tablets over a six-month period.

April 2014	2,000 tablets
May 2014	3,100 tablets
June 2014	2,300 tablets
July 2014	2,100 tablets
August 2014	3,100 tablets
September 2014	3,200 tablets
Total	15,800 tablets

Average monthly consumption of tablet:

$$\frac{15,800}{6} = 2633.3 \text{ tablets}$$

If number of months to cover is also 6 months and remaining inventory is 4,000 tablets

$$Q_0 = (2,633.3 \times 6) - 4,000 \\ = 11,799.8 \text{ tablets}$$

After quantification of need, this is usually reconciled with available funds and quantities are adjusted accordingly.

DATA SOURCES OF CONSUMPTION

3

Monthly consumption may be collated with data obtained from:

- Stock (bin) cards;
- Daily use record;
- Daily cash record; and
- Drug register.

The request indicator (RI) is the level of drugs in stock. It indicates when new orders should be made. It is the quantity that is calculated to last between the period of placing the order and the delivery of the new consignment.

The RI is marked with pencil in the space “RI” on the top right-hand corner of the stock card. It should be updated at least twice a year because consumption may vary due to seasonal changes or epidemics.

This will ensure that no stockout occurs before the next consignment is expected. The stock should not be allowed to fall below this level before a new order is placed. Each stock card must have an RI that is updated from time to time as consumption varies.

REQUEST INDICATOR

3

The stock should never reach “0 level” before a request is made, as there will be a stockout for some time. It is easy to calculate the RI once the monthly consumption is obtained.

If the delivery time is three months and the monthly total consumption is 2633.3. RI is:

$$2633.3 \text{ tablets} \times 3 \text{ months} = 7,900 \text{ tablets}$$

Since the unit of issue is tins of 1,000 tablets, the above figure must be brought to the nearest tin, which is:

$$\begin{array}{r} 7,900 \\ \hline 1000 \end{array} = 7.90 \text{ or } 8 \text{ tins}$$

This means that when the stock of paracetamol is reduced to 8 tins, a new request must be made.

The primary method of procurement in a government facility, as stipulated in RA 9184, is Competitive or Public Bidding. This procurement method is open to any interested and qualified party. Other methods of procurement may be employed whenever justified by the conditions stipulated in the policy and as recommended by the Bids and Awards Committee (BAC). These alternative methods include:

- Limited Source Bidding or Selective Bidding;
- Direct Contracting;
- Repeat Order;
- Shopping; and
- Negotiated Procurement.

PROCUREMENT METHODS

3

The United States Pharmacopeia (USP) however suggests that the preferred method for procuring medicines is Limited Source Bidding. Limited bidding involves a prequalification process where a supplier's technical capacity, financial capability and reputation are evaluated before the invitation to bid is released. Only pre-qualified suppliers receive a request for bids.

It is advisable to make a request on a standard stores requisition/ delivery (issue) form. Ensure that the following items are filled in correctly:

- Name of drug and dosage form;
- Unit of issue and quantity requested;
- Requisition number (it is preferable to begin with a new number each year);
- Name of the dispensary and the date the requisition was made;
- Where the stores requisition/ delivery form is designed to contain all the items listed, fill in only the quantities of those items needed;
- Approximate unit price of each requested item and the approximate total cost of each item;
- Name and signature of the health worker making the requisition;
- Name and signature of the head of health facility; and
- Name and signature of a member of health committee.

RECEIPT OF MEDICINES

3

Upon delivery of supplies to the hospital, these should be inspected and checked against the specifications listed in the Purchase Order:

- Quantity actually corresponds to the quantity indicated on the requisition/ delivery form;
- Original boxes, tins or bottles are unopened and in good condition;
- Labels, expiry dates, dosage form, strength indicated are consistent with the specifications; and
- Physical conditions such as appearance, color, volume, clarity, etc. are within specifications

If there are discrepancies in the deliveries and specifications, these should be properly documented and deliveries should not be accepted.



SUPPLIER PERFORMANCE

In order to enhance safety and ensure quality of products, performance of suppliers must be monitored. A reporting system must be in place and shared to the BAC for use in evaluating suppliers in the future. Data regarding supplier performance that may be tracked include:

- Lead time;
- Compliance with pricing terms;
- Compliance with remaining shelf-life requirements;
- Compliance with packaging and labeling instructions;
- Compliance with technical specifications;
- Compliance with contract terms; and
- Summary of outcomes of performed inspections.

The performance of the supplier may be used to determine whether the supplier will still be allowed to join future bidding projects. Other consequences for performance problems should likewise be determined.

REVIEW QUESTIONS

3

For numbers 1 to 4, write T if the statement is true and F if the statement is false.

1. Procurement in a government health facility such as a public hospital is governed by RA 6675.
2. An efficient procurement system avoids stockouts and ensures continuous availability of medicines.
3. Monitoring supplier performance should be an integral part of the procurement process.
4. Limited bidding is USP's recommended procurement method because of the pre-qualification process for suppliers.

5. Write the letter of the best answer. The following factors are considered in quantifying medicine requirements using consumption method except:

- a) Lead time
- b) Stockouts
- c) Prevalence data
- d) Procurement period

REFERENCES

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Storage and Distribution of Medicines



H

Learning Objectives

At the end of the session, the learner should be able to:

- Explain importance of good storage practices and distribution practices
- Describe good storage and distribution practices
- Identify common problems encountered in storage and distribution of medicines
- Differentiate the drug distribution systems in the hospital

Drug control is among the hospital pharmacist's most important responsibilities. An important part of drug control is drug distribution. Safe distribution of all drugs and related supplies to both inpatients and outpatients must be done. Storage is also an important aspect of the total drug control system. Proper environmental control (i.e., proper temperature, light, humidity, conditions of sanitation, ventilation, and segregation) must be maintained wherever drugs and supplies are stored in the hospital.

STORAGE OF MEDICINES

4

Proper storage conditions are critical to maintain the quality of medicines. Good storage practices should be implemented in order to:

- Ensure stability of the products;
- Avoid contamination and deterioration of the products;
- Avoid deterioration of the packaging/ labeling;
- Prevent or reduce pilferage, thefts and losses; and
- Prevent infestation of pests or vermin.



Good storage practices involve maintaining adequate facilities and developing procedures for receiving, labeling, inventory and security of products. Box 4.1 summarizes key points of good storage practices as recommended by WHO.

Box 4.1. Good storage practices

Key points of good storage practices

- Limit access to storage areas to authorized personnel.
- Ensure proper storage conditions (temperature, humidity, lightning).
- Organize and clearly label storage areas.
- Label clearly an expiry date on all containers.
- Arrange products following First Expiry/ First Out (FEFO) and First In/ First Out (FIFO) principles.
- Perform regular inventories of pharmaceutical materials and products
- Maintain records of all materials in storage and update regularly.

Source: Ensuring Quality in Resource-Limited Countries, 2007

STORAGE OF MEDICINES

4

An adequate storage facility should have an identified area, sufficient space, adequate lighting, clean conditions, temperature and humidity controls, cold chain facility (if needed), shelves and pallets. The shelves maybe used for retail items while bulk supplies may be placed on palettes. The floor and surfaces of storage areas should be covered by materials that can be easily cleaned.

Ideally, products should be arranged by pharmaceutical form then by alphabetical order of generic names then by expiry dates.

Follow any specific indication on packaging (i.e. arrows up). Products should be stored off the floor and adequately spaced to permit cleaning and inspection. It should also be ensured that there is space between boxes of medicines and the wall to prevent absorption of humidity.



4

STORAGE OF MEDICINES

Cleanliness must be maintained in the storage area. Some considerations for cleaning the area include:



- Cleaning on a weekly basis or more often based on the facility's activities;
- Use of dust mop instead of brooms for sweeping since the latter tends to create airborne dust;
- Mopping with soapy water or disinfectant after dusting; and
- Preventing direct contact between cleaning solution and storage containers.

STORAGE OF MEDICINES

4

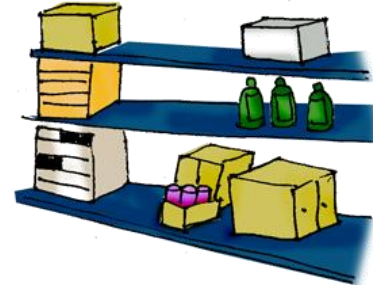
Orderly Arrangement

- Provide sufficient shelving
- Arrange by pharmaceutical dosage form then by alphabetical order of generic names then by expiry dates
- 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; using strong cartons and other empty containers



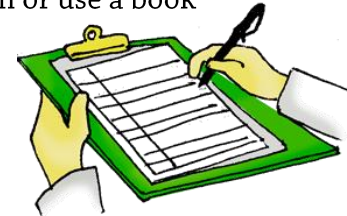
Accountability

- 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



STORAGE OF MEDICINES

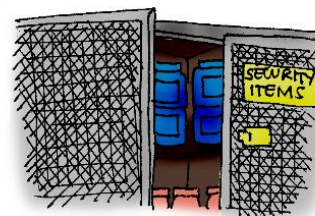
Security

- 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

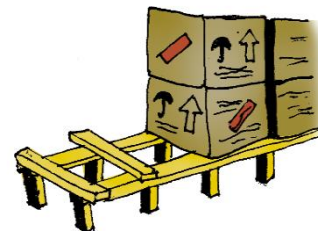
**Bulk Storage**

- Store bulk off the floor
- Allow air circulation
- Limit the height of stacks to prevent crushing



No pallet?

Then improvise: construct a wood frame

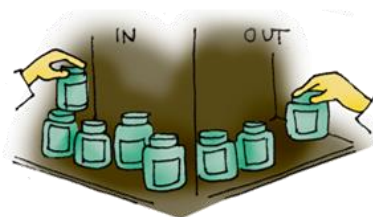


STORAGE OF MEDICINES

4

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



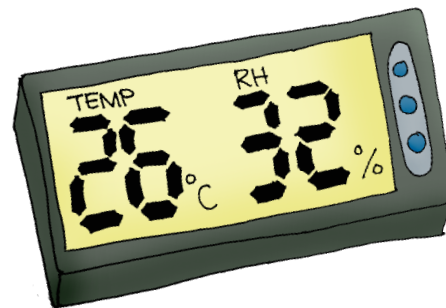
What about without expiry date?
Use FIFO



Figure 4.1. Tips for managing stock in the store room

Source: Managing Access to Medicines and Health Technologies, 2012

Temperature and humidity conditions in the storage area must be monitored daily and records should be kept. A thermometer is used for measuring temperature while a hygrometer is used for measuring relative humidity (RH). These equipment used for monitoring storage conditions should be calibrated at defined intervals, according to standard operating procedures set by the hospital. In most cases, medicines must be kept in dry, well-ventilated premises at temperatures of 15°C to 25°C. If humidity can be controlled, products maybe stored up to 30°C. Humidity in the storage area must not be more than 65% RH. Products must be protected from direct sunlight.



For products with temperature storage requirements like vaccine, a commercially available refrigerator especially designed for medicines is recommended. These refrigerators possess precise electronic control necessary to maintain a temperature range of between 2°C and 8°C and are usually equipped with a thermometer to facilitate ease in monitoring the temperature. These refrigerators should not be placed in the same area where other medicines are stored.

Two general storage rules to follow are:

- Products sensitive to temperatures above 8°C should not be stored near the door.
- Products susceptible to temperatures below 2°C should not be placed in the airflow of the refrigeration unit.

Record-keeping is part of good storage practice. Stock (bin) cards must be maintained for each drug stored in the storeroom. This document is important for goof accountability of stock movements. The cards should be made of cardboard and placed near the drug products that they refer to on the shelves. The following procedures are recommended:

- Enter quantity of seed stock under the “in” and “balance” columns with date, price and supplier.
- Enter quantity of any new stock under the “in” column with date, price, supplier and delivery number.
- Enter balance of stock brought forward under the “balance” column with date.

CONSUMPTION RECORDS

4

- Entries of receipt and issue of drugs are made after the event.
- Always have a balance of stock entered under the “balance” column with date.
- Always issue out full containers of drugs from the store and enter the quantity of drug issued under the “out” column.
- Physically check the actual balance of stock against current balance in stock card from time to time to detect any discrepancy.



The basic types of drug distribution systems that exist in the hospitals include the systems written below. Variations of each system exist, and all systems may be in use in the same facility, depending on the strategy developed. Box 4.2 summarizes key points of good storage practices as recommended by the WHO.

- Bulk ward stock replenishment
- Individual medication order system
- Unit-dose system



Box 4.2. Good distribution practices

Key points of good distribution practices

- Inspect medicines for quality and quantity before distribution.
- Maintain proper storage conditions during transport.
- Verify and document delivery orders.
- Check the integrity of packaging when medicines arrive.
- Clearly label containers.
- Maintain delivery records.
- Provide easy access to delivery records.

Source: Ensuring Quality in Resource-Limited Countries, 2007



I. Bulk Ward Stock Replenishment

In a ward stock system, the pharmacy functions as a warehouse and dispenses bulk containers on requisition without reviewing individual patient drug orders for appropriateness. The main advantage is shorter turnaround time between prescribing and administering the medication. The use of ward stock drugs should be minimized, but it is appropriate and desirable for certain situations:

- In emergency departments and operating rooms, drugs are usually required immediately after the doctor prescribes them. Unless a pharmacy satellite is located in these emergency areas, dispensing drugs according to individual patient orders is not possible. Unfortunately, drugs used in these situations are often expensive, and control is always a challenge for the pharmacy department.

- In life-threatening emergency situations, drugs need to be kept in patient care areas as a time-saving measure.
- High-volume, low-cost drugs can be dispensed from ward stock if the patient safety risk is low.

II. Individual Medication Order System

The individual medication order system closely resembles dispensing to outpatients: a course of therapy is dispensed according to a written prescription for an individual patient. Compared with bulk ward stock, the advantages are that the pharmacist can review the appropriateness of therapy, a patient-specific medication profile can be maintained, pharmacy charges to patients are facilitated, and closer control of inventory is possible. This system can limit the time intervals for dispensing: for example, an individual supply for three days of therapy is sent initially; if therapy is continued beyond three days, the empty container is returned to the pharmacy to be refilled.

III. Unit-dose System

A preferred system from a patient care perspective is the unit-dose system, which has a lower possibility for error. Medications are dispensed in unit-dose packages (i.e. each dose is separately packaged) in separate bins or drawers for each patient. Commonly, a 24-hour supply is provided. Drugs returned to the pharmacy can be put back in stock without concern for identity or contamination. This system is efficient but requires a large initial capital outlay for the purchase of repackaging machines and medication cabinets with individual patient drawers. The cost per delivered dose is higher than with bulk packaging, but this increased expense may be offset by reduced wastage and easier detection of leakage. Hospitals in some countries have found innovative ways of adapting local technologies to construct their own fixtures and equipment.

DISTRIBUTION OF MEDICINES

4

Storage and Distribution
of Medicines

Table 4.1. Comparison matrix for drug distribution system

Factor	Bulk Ward Stock Replenishment	Individual Medication Order System	Unit-dose System
Material and supply costs	Low	Medium-low	High
Pharmacy labor costs	Low	Medium	High
Nursing labor costs	Medium-low	Low	Low
Pilferage risk	High	Medium	Low
Medication error risk	High	Medium-low	Low

Source: Managing Access to Medicines and Health Technologies, 2012

4

REVIEW QUESTIONS

For numbers 2 to 4, write T if the statement is true and F if the statement is false.

1. Give the meaning of FEFO and FIFO.
2. Humidity in the storage area must not be greater than 56% RH.
3. The stock cards should be placed near the drugs that they refer to on the shelves.
4. Drug distribution is an important part of drug control.
5. It is the preferred drug distribution system from a patient care perspective.
 - a) Bulk ward stock replenishment
 - b) Individual medication order system
 - c) Unit-dose system

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Use of Medicines

H

Learning Objectives

At the end of the session, the learner should be able to:

- Define rational use of medicines
- Explain the medication use process
- Identify parts of the prescription
- Interpret a prescription
- Prepare and dispense the required medication
- Record consumption of medicines
- Determine the actions to be taken in the case of adverse drug reaction and medication errors

The last step in the drug management system is the rational use of medicines or provision of medicines to the patients. This requires rational prescribing practices, good dispensing procedures and patient adherence.

INTRODUCTION

5

Use of Medicines

Irrational medicine use includes overuse, underuse, and inappropriate use, caused by such factors as lack of adequate regulatory systems; shortages of essential medicines and availability of nonessential medicines; lack of sound, objective medicine information; and the considerable influence of medicine promotion on both prescribers and patients.

Rational use of medicines requires that the patient is prescribed with the appropriate medicine after proper diagnosis. It also requires that the patient receives the medicine according to the following:

- Appropriate dose;
- Appropriate dosage form;
- Appropriate route of administration;
- Appropriate frequency of administration;
- Appropriate duration of treatment;
- Appropriate information to the patient; and
- Adequate follow up.

The medicine use process is outlined in Figure 5.1.

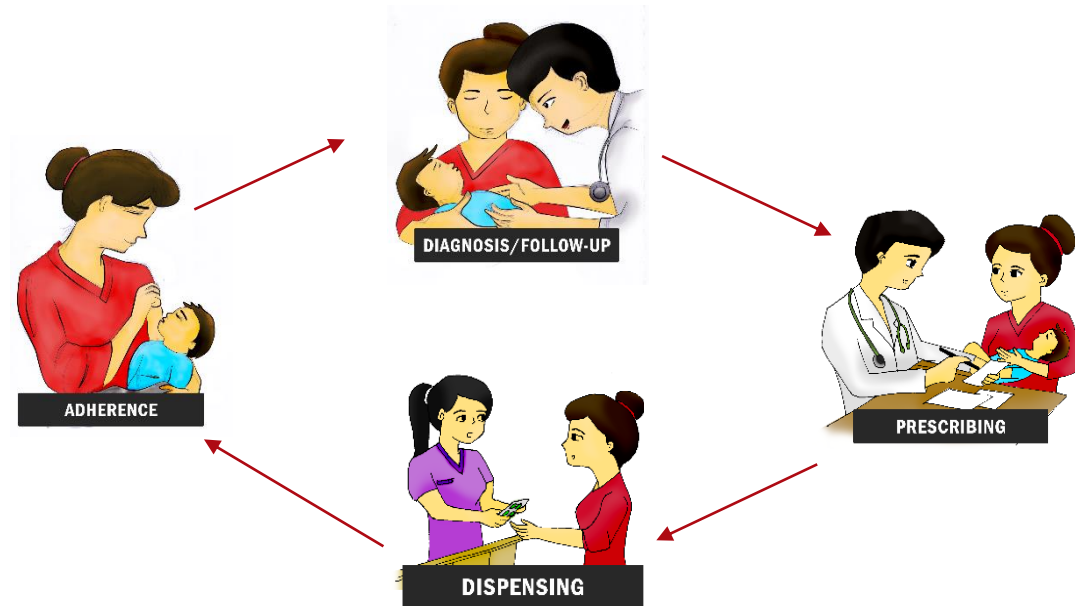


Figure 5.1. The medicine use process

Source: Managing Access to Medicines and Health Technologies, 2012

A prescription is written after diagnosis or a health problem has been identified by a doctor. It is a set of instructions written by a doctor to the dispenser for supply of medicines. Doctors should prescribe according to the PNF and the latest standard treatment guidelines. A prescription should have the following:

- Name of patient and age;
- Date;
- Generic name and dosage form;
- Dose;
- Frequency of administration;
- Duration of treatment; and
- Prescriber's signature and name.



Figure 5.2 shows an example of the parts of a prescription.

5

Use of Medicines

Prescriber Information	Juan Dela Cruz, MD Tower A Bldg., Boni Ave., Mandaluyong City Tel No.: 531-4534		
	Clinic Schedule: Monday: 1:00PM – 5:00PM Friday: 9:00AM – 12:00PM Tue – Thur: 10:00AM – 3:00PM Saturday: 12:00PM – 3:00PM		
Patient Information	Name: <u>Sarah Gonzales</u> Address: <u>Boni Avenue, Mandaluyong City</u> Age: <u>8</u> Sex: <u>F</u> Date: <u>6/21/2012</u>		
	Rx		
Superscription (Rx in Latin is Recipe meaning 'take thou')	<u>Amoxicillin 250mg/5ml Susp.</u> # 2 lots		
	<u>Reconstitute with water to make 60 mL suspension</u>		
Subscription (Instructions to Pharmacist)	<u>Sig. Take 1 tablespoon TID for 7-10 days</u>		
	Physician's Sig: <u>12345</u> Lic. No. <u>1234567</u> PTR No. _____ S2 No. _____		
			Date Prescription is Written
			Inscription (Medication Prescription)
			Signa (Directions for Patient)

Figure 5.2 Parts of a prescription

TYPES OF INCORRECT PRESCRIPTIONS

Erroneous Prescription:

- The brand name precedes the generic name.
- The generic name is the one in parenthesis.
- The brand name is not in parenthesis.
- More than one drug product is prescribed on one prescription form.

What to do with erroneous prescriptions:

Erroneous prescriptions shall be filled. Such prescriptions shall be kept and reported by the pharmacist of the drug outlet or any other interested party to the nearest DOH Office for appropriate action.

Violative Prescription

- The generic name is not written.
- The generic name is not legible and a brand name which is legible is written.
- The brand name is indicated and instructions added, such as the phrase “No substitution” which tend to obstruct, hinder, or prevent generic dispensing.

What to do with violative prescriptions:

Violative prescriptions shall not be filled. They shall be kept and reported by the pharmacist of the drug outlet or any other interested party to the nearest DOH office for appropriate action. The pharmacist shall advise the prescriber of the problem and/or instruct the customer to get the proper prescription.

TYPES OF INCORRECT PRESCRIPTIONS

Impossible Prescription

- Only the generic name is written but is not legible.
- The generic name does not correspond to the brand name.
- Both the generic name & the brand name are not legible.
- The drug product prescribed is not registered with FDA.

What to do with impossible prescriptions:

Impossible prescriptions shall not be filled. They shall be kept and reported by the pharmacist of the drug outlet or any other interested party to the nearest DOH office for appropriate action. The pharmacist shall advise the prescriber of the problem and/or instruct the customer to get the proper prescription.

Dispensing refers to the process of preparing and giving medicine to a patient on the basis of a prescription. It involves the correct interpretation of the orders of the prescriber and the accurate preparation and labeling of medicine for use by the patient.



Dispensing environments must be clean, because most drug products are for internal use, making it important that they be hygienic and uncontaminated. The environment must also be organized so that dispensing can be performed accurately and efficiently. The dispensing environment includes:

- Staff;
- Physical surroundings;
- Shelving and storage areas;
- Surfaces used during work; and
- Equipment and packaging materials.



It covers all activities involved, from receiving the prescription to issuing the prescribed medicine to the patient. It involves six major steps (see Figure 5.3):

- Receive and validate the prescription;
- Understand and interpret the prescription;
- Prepare and label items for issue;
- Make a final check;
- Record the action taken; and
- Issue medicine to the patient with clear instructions and advice.



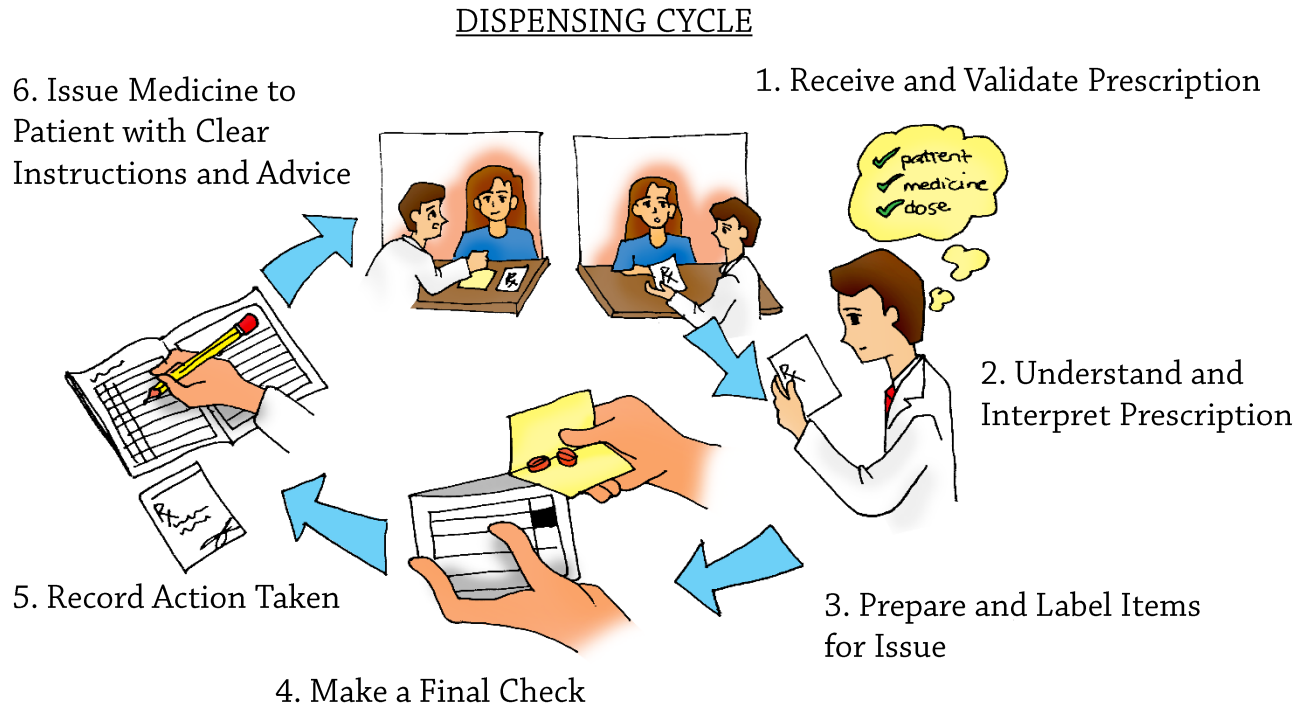


Figure 5.3. The medicine use process

Source: Managing Access to Medicines and Health Technologies, 2012

1. Receive and validate the prescription

Upon receiving a prescription, the staff member responsible should confirm the name of the patient. Cross-checking the name and identity of the patient must also be done when issuing the medicines.

2. Understand and interpret the prescription

Interpreting a prescription must be done by a staff member who can:

- Read the prescription;
- Correctly interpret any abbreviations used by the prescriber;
- Confirm that the doses prescribed are in the normal range for the patient (in consideration of sex and age);
- Correctly perform any calculations of dose and issue quantity; and
- Identify any common drug-drug interactions.

3. Prepare and label items for issue

Select stock container or prepack

A good dispenser selects the item by reading the label and cross-matching the product name and strength against the prescription. The dispenser should check the stock to make sure that it has not expired and choose the oldest stock (FIFO) or first expiry (FEFO). Most well-trained staff members deliberately read the container label at least twice during the dispensing process.

Measure or count quantity from stock containers

Liquids must be measured in a clean vessel and should be poured from the stock bottle with the label kept upward. Tablets and capsules can be counted with or without the assistance of a counting device. The most important rule to follow is that the dispenser's hands must not be in direct contact with the medicine.

Counting should be done using one of the following:

- clean piece of paper and clean knife or spatula;
- clean tablet-counting device;
- lid of the stock container in use; or
- any other clean, dust-free surface.

Immediately after measuring or counting, the stock container lid should be replaced and the stock container label should be rechecked for drug name and strength.

Pack and label medicine

Tablets or capsules should be packed into a clean, dry container, such as a bottle, plastic envelope, cardboard box, or paper envelope. Table 5.1 covers packaging categories according to the dosage forms of medicines handled.

Packaging is categorized as follows:

- Desirable: Packaging should meet listed requirements for a period greater than 30 days.
- Acceptable: Packaging should meet listed requirements for up to 30 days.
- Undesirable: Packaging provides no protection from dirt, moisture, or other contaminants, thus permitting rapid deterioration or contamination.

Table 5.1. Packaging materials for medicine dispensing

Category of Packaging	Package Characteristics	Examples
<u>Tablets/ capsules</u>		
Desirable	Clean, dry, plastic or glass container with tight-fitting cap or seal	Blister packages, plastic sachets, tightly sealing plastic or glass containers with screw or snap cap
Acceptable	Clean, dry container that provides protection from dirt and moisture	Zipper-lock plastic bags, glycine paper, tin with tight-fitting lid
Undesirable	Unclean absorbent paper, cotton, cardboard containers with no provision for closure	Unsealed plastic bags, paper bags, newspaper or other printed paper

Table 5.1. Packaging materials for medicine dispensing (cont.)

Category of Packaging	Package Characteristics	Examples
<u>Liquids (oral and topical)</u>		
Desirable	Clean, dry, light-resistant glass container with tight-fitting cap	Amber or opaque bottle with screw cap
Acceptable	Clean, dry plastic or glass container with tight-fitting cap	Glass or plastic bottle with tight-fitting cap
Undesirable	Unclean paper, cardboard, metal, or plastic (not formed) container with no provision for closure	Previously used liquid-containing cartons, plastic-lined paper bags, plastic bags

Table 5.1. Packaging materials for medicine dispensing (cont.)

Category of Packaging	Package Characteristics	Examples
<u>Liquids (otic and ophthalmic)</u>		
Desirable	Clean (preferably sterile), light-resistant glass or plastic container with a dropper incorporated into a tight-fitting cap or a top fitted with a dropper with a protective sleeve	Amber dropper bottle, opaque plastic dropper bottle
Acceptable	Clean, dry plastic or glass container with tight-fitting cap and a clean plastic/ glass dropper (separate)	Glass or plastic bottle with tight-fitting cap, glass or plastic dropper with protective container (cardboard, zipper-lock, plastic, or paper)
Undesirable	Anything other than above	Anything else

Table 5.1. Packaging materials for medicine dispensing (cont.)

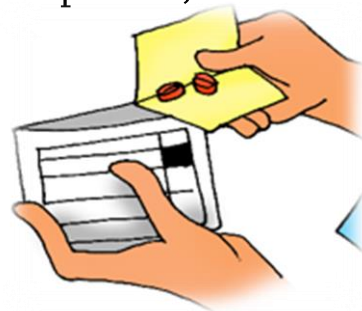
Category of Packaging	Package Characteristics	Examples
<u>Creams/ointments</u>		
Desirable	Clean glass or porcelain wide-mouth jar with tight-fitting lid or collapsible plastic or metal tube	Wide-mouth jar with tight-fitting lid, cream or ointment tube with cap
Acceptable	Clean glass or porcelain jar with lid	Glass or porcelain jar
Undesirable	Anything other than above	Anything else

Source: Managing Access to Medicines and Health Technologies, 2012

4. Make a final check

At this point, the dispensed preparation should be checked against the prescription and against the stock containers used. Although this step can be done as a self-check, it is valuable to have the final check done by another staff member. The final check should include:

- Reading and interpreting the prescription before looking at the dispensed medicines;
- Checking the appropriateness of doses prescribed and checking for drug interactions;
- Checking the identity of the medicine dispensed;
- Checking the labels; and
- Countersigning the prescription.



5. Record action taken

Three different methods can be used to keep a record of medicines dispensed.



- When the prescription is retained, the dispenser should initial and annotate the prescription with strength and quantities dispensed and either file it or enter the details into a record book as soon as time is available.
- When the prescription is returned to the patient, details of the medicines dispensed must be entered into a record book before the items are issued to the patient. The date, the patient's name and age, the medicine name and strength, the amount issued, and the dispenser's name should be entered into the register.

- When dispensers use computers to record the dispensing details, the computer program should retain the information, which can then be recalled to generate summary reports.

6. Issue medicine to the patient or the patient's representative with clear instructions and advice

Apart from information on the dose, frequency, length of treatment, and route of administration, priority should be given to providing information that will maximize the effect of the treatment. Advice should therefore concentrate on:

- When to take the medicine (particularly in relation to food and other medicines);
- How to take the medicine (chewed, swallowed whole, taken with plenty of water, etc.); And
- How to store the medicine

Warnings about possible side effects should be given cautiously. Common but harmless side effects should be mentioned to prevent a frightened patient from stopping the treatment. More serious side effects should be mentioned only with the agreement of the prescriber, who needs to take those risks into account when prescribing the medicine

Every effort must be made to confirm that the patient understands the instructions and advice. Whenever possible, the staff member dispensing the medications should have the recipient repeat back the instructions.

DISPENSING PROCESS

5

Every patient must be treated with respect. The need for confidentiality and privacy when explaining the use of some types of medicine must be recognized, and efforts should be made to structure medicine collection so that advice to patients can be as individualized as possible.



LABELING OF DISPENSED MEDICINES

Medicines should be placed in a suitable and appropriately labeled container to ensure correct use and maintain potency and quality during the period of use. This is also in compliance to RA 6675. The label should contain the following:

- Name of the health facility;
- Name of the patient;
- Drug name (use generic name);
- Strength;
- Quantity;
- Dosage regimen;
- Auxiliary labels with instructions (e.g. Shake well before using) or cautions (e.g. May cause drowsiness)
- Date of dispensing; and
- Product batch number and expiry date (if possible).



WHO defines pharmacovigilance as “the science and activities relating to the detection, assessment, understanding and prevention of adverse effects or any other medicine-related problem.”

Relationship Between Pharmacovigilance and Drug Management

Health professionals may still think of pharmacovigilance strictly in terms of identifying and reporting previously unknown and serious ADEs related to new products; however, pharmacovigilance activities are related to every sector of the drug management cycle.

Table 5.2. Pharmacovigilance and the drug management framework

Pharmacovigilance Activity	Detection Within the Pharmaceutical Management Framework	Prevention
Product quality assurance	<ul style="list-style-type: none">• Most product quality issues are detected in the distribution portion of the pharmaceutical management cycle.• Physician inspection is done at the time of receiving the product from the supplier and at other points of distribution to the patient.• Complaints about efficacy occur during use.	<ul style="list-style-type: none">• Prequalify suppliers during procurement.• Establish a pharmaceutical quality assurance program.• Establish a policy and legal framework that addresses pharmaceutical quality.• Enforce laws and regulations related to product quality.

Table 5.2. Pharmacovigilance and the drug management framework (cont.)

Pharmacovigilance Activity	Detection Within the Pharmaceutical Management Framework	Prevention
ADR detection	<ul style="list-style-type: none"> • Management support functions, such as surveillance and monitoring systems, during use are the primary methods for detecting ADRs. 	<ul style="list-style-type: none"> • Consider ADR information during the selection process to make formulary decisions and establish standard treatment guidelines. • Report ADRs to the appropriate parties at the facility, national, and international levels. • Train health professionals about ADRs. • Communicate with patients about ADRs. • Issue prescribing guidelines. • Establish monitoring guidelines. • Improve written and oral communication. • Involve patient and family in care plan.

Source: Managing Access to Medicines and Health Technologies, 2012

Areas of pharmacovigilance

Three areas of pharmacovigilance include the following:

- product quality
- adverse drug reactions
- medication errors

Pharmaceutical Quality

The purpose of quality assurance in drug supply systems is to help ensure that each medicine reaching a patient is safe, effective, and of appropriate quality. The quality of drug products is ensured by the technical and managerial activities of the quality system, which includes evaluating drug product documentation, performing or reviewing quality-control laboratory tests, and monitoring product performance. Managerial activities include selecting reliable suppliers, preparing contract terms, monitoring supplier performance, and performing inspection procedures throughout the distribution network.

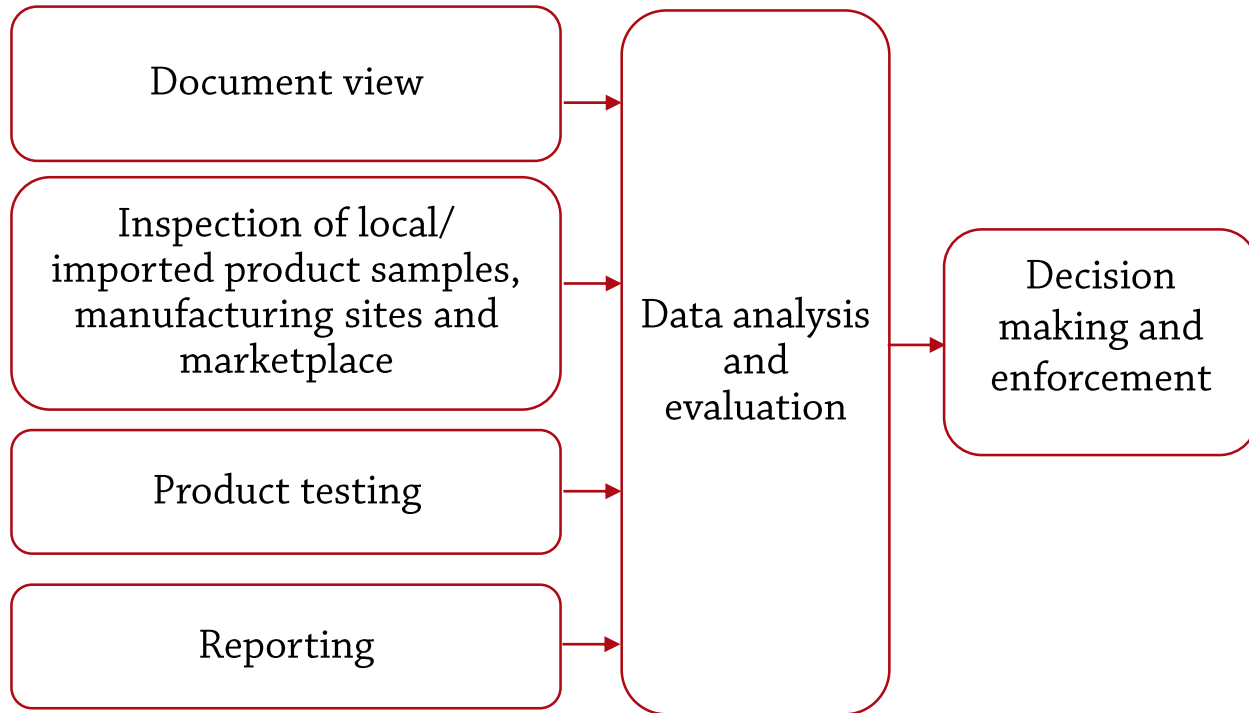


Figure 5.4. Quality assurance framework

Source: Managing Access to Medicines and Health Technologies, 2012

Adverse Drug Reaction (ADR) is a harmful response in the patient caused by the drug itself given in the recommended manner (dose, frequency, route, administration technique). Examples include allergic reactions, effects from withdrawal, or reactions caused by interactions with other drugs. WHO defines a serious ADR as “any reaction that is fatal, life-threatening, or permanently or significantly disabling; requires or prolongs hospitalization; or relates to misuse or dependence.”

ADR Monitoring

The Pharmacovigilance Unit of the Food and Drug Administration (FDA) is responsible for ADR monitoring and reporting. To facilitate information gathering, the FDA provides case report forms to health providers on ADRs. All healthcare providers, including doctors, pharmacists, nurses, dentists, and others, should report ADRs as part of their professional responsibility.

ADVERSE DRUG REACTIONS

5

Use of Medicines

The completed case report form is then sent to the regional or national ADR center or to the manufacturer of the product. The form contains the following:

- patient's particulars;
- details of the ADR;
- management of ADR; and
- reporter's particulars.

Figure 5.5 shows an example of an ADR monitoring form.

Patient's Particulars

Details of the ADR

Management of ADR

Reporter's Particulars

SUSPECTED ADVERSE REACTIONS FORM V.4 (2012)
"Saving Lives Through Vigilant Reporting"
**FIELDS MUST BE COMPLETED.*

For FDA use only
 ADR No. 701-2001
 Date received

All reports are confidential.

PATIENT'S PARTICULARS

Patient's Name or Initials: _____ Sex: ☐ Male ☐ Female Weight: _____ Kg Height (cm): _____
 Address or Contact Number: _____ Age: _____ Date of Birth (mm/dd/yy): _____
 Medical History/Admitting Diagnosis: _____ Ethnic group: ☐ Filipino ☐ Chinese ☐ Caucasian
 Any Known Allergy: ☐ No ☐ Yes, Specify: _____ Pregnancy Status: _____ No
 Hospital/facility, if admitted: _____ (Yes 1st, 2nd, 3rd trimester)

DETAILS OF THE ADVERSE REACTION

Date of onset: _____ mm _____ day Do you consider the reaction to be serious? ☐ Yes, if yes indicate why: ☐ No
 Describe the reaction, including pertinent laboratory data: _____
☐ Patient died due to reaction
☐ Involved or prolonged in-patient hospitalization
☐ Life threatening
☐ Involved permanent or significant disability
☐ Congenital anomaly in this newborn
☐ Other (specify, disease and details): _____
 Can this be due to Medication Error? ☐ No
☐ Yes, if yes, which type:
 _____ Prescribing
 _____ Dispensing
 _____ Administration

Can the adverse reaction be due to:
 1. Product quality defect: ☐ No ☐ Yes, Specify, encircle: color change; caking; ponding; counterfeit; odor change; defective container; contamination; separation of components; undissolved suspension/powder
 2. Therapeutic failure: ☐ No ☐ Yes, Specify, encircle: antimicrobial resistance; drug interaction; poor compliance; counterfeit; expired; improper storage; under-dosing; inappropriate medication; inappropriate route of administration; no previously known adverse

Suspected drug product(s) Indicate brand name	Daily Dose	Route	Date started	Date stopped	Reasons (s) for using the product (encircle)	Manufacturer and Batch/Lot No.

Use all other drugs taken at the same time and/or 3 months before. If none, check box. ☐ No Other drugs taken

Brand name of the drug	Daily Dose	Route	Date started	Date stopped	Reasons for using the drug	Manufacturer and Batch & Lot No.

MANAGEMENT OF ADVERSE REACTION

Was treatment given? ☐ No ☐ Yes (if yes, please specify): _____
☐ Recovered (Date of recovery): _____ ☐ Unrecovered _____ Other diseases: _____ (w/ _____ renal _____ HPN)
☐ Fatal (Date of death): _____ ☐ Unknown _____ ☐ CVS _____ Endocrine _____ Cancer _____
 Sequela; (any permanent complications or injuries as a result of the ADR) Re-challenge? ☐ Yes ☐ Result: _____
☐ Yes (Please specify) _____ ☐ No ☐ Unknown ☐ No

REPORTER'S PARTICULARS

*Printed Name of Reporter: _____ *Contact no.: _____
 Signature of reporter: _____ *Email address: _____
☐ Reported (mm/dd/yy): _____ *Profession: _____ MD _____ RPh _____ RN _____ Patient _____ Dental _____ other
 *Facility: _____ Clinic _____ Triage site _____ Other _____

FDA National Pharmacovigilance Center
"Saving Lives Through Vigilant Reporting"
 Send completed form to: ADR Unit, FDA, Civic Drive, Filinvest East Tower, Alabang, Muntinlupa, 1781.
 Or fax to: (02) 8707373 or (02) 8707371, or The ADR Unit, Send sample, if any, of suspect drug for analysis.
 Website: www.fda.gov.ph

Figure 5.5. Example of an ADR monitoring form

Downloadable from:

https://www.mims.com/resources/portal/Philippines/document/ADR_Form.pdf

The DOH has developed the Adverse Drug Online Reporting System (ADORS) to strengthen the reporting of ADR as required by the Pharmacovigilance Unit of the FDA. The system allows online reporting of medical practitioners, hospitals or the public. The system establishes a central database of ADR cases and promotes efficiency in data collection, processing, validation, analysis and dissemination of data. It provides quality data and/or information that is accurate, reliable, timely and meaningful; and it is also a mechanism to inform the Pharmacovigilance Unit of the FDA on suspected drug reactions and complications.

Medication Errors

The National Coordinating Council for Medication Error Reporting and Prevention (NCCMERP) in the United States defines medication error as “any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the health care professional, patient, or consumer”. Errors can be either harmless or detrimental to the patient.

Medication errors are caused by faulty systems, processes, and conditions that lead people to make mistakes. For example, stocking wards in hospitals with certain concentrated solutions, even though they are toxic unless diluted, has resulted in deadly errors. Other problems can result from illegible handwriting, use of dangerous abbreviations (see Table 5.3), overlooked interactions with other medicines, verbal miscommunications and sound-alike or look-alike drugs (SALADs).

Table 5.3. Dangerous abbreviations

Abbreviation	Intended Meaning	Common Error	Preferred Term
U	Units	Mistaken as a 0 (zero) or a 4 (four), resulting in overdose. Also mistaken for cc (cubic centimeters) when poorly written.	Write unit.
Mg	Micrograms	Mistaken for mg (milligrams), resulting in a one-thousand-fold overdose.	Write mcg.
Q.D.	Latin abbreviation for every day	The period after the Q has sometimes been mistaken for an I, and the drug has been given QID (four times daily) rather than daily.	Write daily.
Q.O.D.	Latin abbreviation for every other day	Misinterpreted as QD (daily) or QID (four times daily). If the O is poorly written, it looks like a period or an I.	Write every other day.

MEDICATION ERRORS

5

Table 5.3. Dangerous abbreviations (cont.)

Abbreviation	Intended Meaning	Common Error	Preferred Term
SC or SQ	Subcutaneous	Mistaken as SL (sublingual) when poorly written.	Write subcutaneous or subcut.
TIW	Three times a week	Misinterpreted as three times a day or twice a week.	Write specific days for administration, for example, MON., WED., and FRI.
D/C	Discharge; also discontinue	Patient's medications have been prematurely discontinued when D/C (intended to mean discharge) was misinterpreted as discontinue, because it was followed by a list of drugs.	Write discharge or discontinue.

Table 5.3. Dangerous abbreviations (cont.)

Abbreviation	Intended Meaning	Common Error	Preferred Term
HS	Half strength	Misinterpreted as the Latin abbreviation HS (bedtime)	Write half strength.
Cc	Cubic centimeters	Mistaken as U (units) when poorly written.	Write ml or mL or mls for milliliters.
AU, AS, AD	Latin abbreviation for both ears; left ear; right ear	Misinterpreted as the Latin abbreviation OU (both eyes); OS (left eye); OD (right eye).	Write ear.

Table 5.2. Dangerous abbreviations (cont.)

Abbreviation	Intended Meaning	Common Error	Preferred Term
Lack of leading zero (.X mg) or use of a trailing zero (X.0mg)		Decimal point is missed, resulting in a dosage error of tenfold or greater.	Always lead with a zero before a decimal point (0.X mg). Never follow a whole number with a decimal point and zero (X mg).
@	at	Mistaken as zero.	Write at.
MS, MSO4 MgSO4	Morphine sulfate, Magnesium sulfate	Confused for each other.	Write morphine sulfate or magnesium sulfate.
IU	International Unit	Mistaken as IV (intravenous) or 10 ten.	Write International unit.

Source: Managing Access to Medicines and Health Technologies, 2012

Adverse Drug Event (ADE) is a harmful response that is caused by a drug or the inappropriate use of a drug. On the other hand, ADR is a harmful response that is caused by the use of drugs at normal doses. Therefore, an ADR is always an ADE, but an ADE might include the result of an overdose because of a dispensing error or some other error occurring during the medication-use process.

Medication-usage patterns strongly influence the incidence of ADEs. In addition, self-medication, lack of regulatory control over the sale of medicines, and irrational prescribing all contribute to the incidence of ADEs.

ADEs are preventable when they are the result of a medication error. They are nonpreventable, as would be the result of an unknown allergy. A potential ADE could include an error that may or may not reach the patient but does not cause harm, such as dispensing error that was discovered and avoided at the last minute. The documentation of ADEs and ADRs is important especially in new products where such postmarketing information can result in changes to the recommended usage, product packaging or labeling, or even a recall. Identifying and documenting potential ADEs are useful because this can identify problem areas that might be corrected, such as a communication problem within the health facility or two medicines with similar names being stored next to each other.

After the ADR data have been collected, they should be analyzed to determine severity, probable causality, and preventability. Specific algorithms and classification systems have been developed for these analyses:

A. Severity (impact on the patient's health): Table 5.4 shows a classification for determining the severity of ADRs. It addresses both ADEs associated with medication error and those not associated with error, so it can be applied to all medication events.

Table 5.4. NCCMERP Index for categorizing medication errors

Category	Description
A	Circumstances or events that have the capacity to cause error
B	An error occurred but the error did not reach the patient
C	An error occurred that reached the patient but did not cause harm
D	An error occurred that reached the patient and required monitoring to confirm that it resulted in no harm to the patient or required intervention to preclude them
E	An event occurred that may have contributed to or resulted in temporary harm to the patient and required intervention
F	An event occurred that may have contributed to or resulted in temporary harm to the patient and required initial or prolonged hospitalization
G	An event occurred that may have contributed to or resulted in permanent patient harm
H	An event occurred that required intervention necessary to sustain life
I	An event occurred that may have contributed to or resulted in the patient's death

Source: Managing Access to Medicines and Health Technologies, 2012

B. Probable causality (likelihood that the medicine's use or lack of use contributed to the ADR): Table 5.5 illustrates how to calculate the Naranjo Probability Score, a common method for determining whether a particular medicine was actually related to the ADR.

Table 5.5. Determining ADR probability using indicators

Probability Scale: Indicators	Yes	No	Don't Know
1. Are there previous conclusive reports on this ADR?	+1	0	0
2. Did the ADR appear after the suspected drug was administered?	+2	-1	0
3. Did the ADR improve when the drug was discontinued or a specific antidote was administered?	+1	0	0
4. Did the ADR reappear when the drug was readministered?	+2	-1	0

Table 5.5. Determining ADR probability using indicators (cont.)

Probability Scale: Indicators	Yes	No	Don't Know
5. Could alternative causes (other than the drug) have caused the ADR on their own?	-1	+2	0
6. Was the drug detected in the blood (or other fluids) in a concentration known to be toxic?	+1	0	0
7. Was the ADR more severe when the dose was increased or less severe when the dose was decreased?	+1	0	0
8. Did the patient have a similar ADR to the same or similar drugs in any previous exposure?	+1	0	0
9. Did any objective evidence confirm the ADR?	+1	0	0
Total score = _____ Possible = 0-4 Probable = 5-8 Definite = >9			

Source: Managing Access to Medicines and Health Technologies, 2012

C. Preventability (Was an error associated with the event?): Box 5.1 is a checklist used to help determine if the ADE was caused by a medication prescribing error, and therefore, preventable.

Box 5.1. Determining whether a medication error occurred

- ☐ Was the drug involved appropriate for the patient's clinical condition? (NO = Preventable)
- ☐ Was the dose, route, or frequency of administration appropriate for the patient's weight, or disease state? (NO=Preventable)
- ☐ Was required therapeutic pharmaceutical monitoring or other necessary laboratory tests performed? (NO=Preventable)
- ☐ Was there a history of allergy or previous events to the drug? (YES=Preventable)

Box 5.1. Determining whether a medication error occurred (cont.)

- ☐ Was an interaction (medicine-medicine; medicine-food; medicine-herbal) involved in the ADR? (YES=Preventable)
- ☐ Was a toxic serum drug concentration (or laboratory monitoring test) documented? (YES=Preventable)
- ☐ Was poor compliance involved in the ADR? (YES=Preventable)
- ☐ Was the error considered preventable because of deviations in procedures or standards of practice? (YES=Preventable)

Source: Managing Access to Medicines and Health Technologies, 2012

Write T if the statement is true and F if the statement is false.

1. Rational use of medicines includes rational prescribing, good dispensing procedures and patient adherence.
2. Bottles and plastics are recommended for repacking tablets and capsules.
3. Written information is provided to the patient to replace actual provision of information by the dispenser
4. Adverse drug events are not preventable when they are the result of a medication error.
5. The Pharmacovigilance Unit of the Food and Drug Administration is responsible for ADR monitoring and reporting.

MANAGEMENT SCIENCES FOR HEALTH, INC. 2012. *Managing Access to Medicines and Health Technologies*. [online]. [Accessed 10 November 2014]. Available from: <<http://www.msh.org/sites/msh.org/files/mds3-jan2014.pdf>>

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Pharmaceutical Donations



Learning Objectives

At the end of the session, the learner should be able to:

- Explain the need for guidelines on the acceptance of foreign and local donations especially during emergency and disaster situations
- Discuss the national policy governing foreign and local donations
- Identify criteria for accepting donations
- Identify current weaknesses of the existing policy/ process in accepting donations at the hospital
- Recommend improvements to the current system

The Philippines has consistently suffered from health problems and disruption of health services arising from various forms of disasters. In times of disasters, large quantities of pharmaceuticals from local and international sources are donated thereby partially addressing the medical needs of its recipients. Often however, these donations also cause problems of inadequate storage spaces and disposal.

INTRODUCTION

6

Some pharmaceuticals may arrive past or near expiry, in extremely large or unwanted quantities, labeled in a foreign language or simply unwanted or not needed in the particular area. In addition, the argument that products with short expiry dates can be donated in the case of acute emergencies, because they will be used rapidly, is incorrect. In emergency situations the systems for reception, storage and distribution of drugs are very often disrupted and overloaded, and many donated drugs tend to accumulate. These problems necessitate the need for clear policies to guide both donors and recipients and hence maximize the potential benefit of drug donations.



ACCEPTING DONATIONS

Administrative Order (AO) 2007-0017 known as Guidelines on the Acceptance and Processing of Foreign and Local Donations during Emergency and Disaster Situations, provides a rational and systematic procedure for the acceptance, processing and distribution of foreign and local donations that are exclusively for unforeseen, impending, occurring and experienced emergency and disaster situations. It specifies the criteria for accepting donations as well as responsibilities of the different government institutions within the DOH.



ACCEPTING DONATIONS

6

AO 2007-0017 states that donations related to health and medicine fall under the jurisdiction of the DOH. The DOH accepts, distributes and monitors movement of the donated items. The criteria for drugs and medicines that can be accepted are as follows:

- Shelf life of at least 12 months from the time of arrival to the Philippines;
- Labeling with English translation or in a language understood by health professionals;
- Packaging that complies to international shipping regulations accompanied by a detailed packing list;
- Weight per carton should not exceed 50 kg;
- Exclusive packaging with regard to other supplies;
- Documentary proof of compliance to applicable quality standards; and
- Documentary proof that items are obtained from reliable sources.

ACCEPTING DONATIONS

This policy also states that acceptance of donations shall be based on the expressed need of the beneficiaries and relevant to the diseases pattern and health concerns that are prevailing in the affected area. A DOH Package List for Emergencies and Disasters which contains the drugs and medicines which in accordance to the PNF shall be the basis of determining the acceptability of items for donation for purposes of emergencies and disaster situations.

However, drugs and medicines which are not included in the PNF list may be accepted after thorough evaluation of the FDA, on a case to case basis.



ACCEPTING DONATIONS

6

The hospitals may accept donations but are likewise expected to follow the existing criteria set forth by the DOH. The policy however does not define administrative procedures for receipt of donations at the hospital. The absence of clear administrative procedures may result to problems discussed earlier.

The WHO Guidelines on Drug Donations listed important issues that should be addressed and defined:

1. Decide who is responsible for defining the needs, and who will prioritize them.
2. Decide who coordinates all drug donations.
3. Which documents are needed when a donation is planned; who should receive them?
4. Which procedure is used when donations do not follow the guidelines?
5. What are the criteria for accepting/ rejecting a donation, and who makes the final decision?

6. Decide who coordinates reception, storage and distribution of the donated drugs.
7. How are donations valued and entered into the budget/expenditure records?
8. How will inappropriate donations be disposed of?

It is important that hospitals create specific and clear guidelines regarding acceptance of donations taking into consideration the current policy of the DOH.

REVIEW QUESTIONS

6

For numbers 1 to 3, write T if the statement is true and F if the statement is false.

1. Medicine donation with short expiration dates may be accepted as long as it can be utilized prior to expiration.
2. Donations must be accepted only if there is an expressed need for the said medicine/ supply.
3. The hospitals may accept donations but are expected to follow the existing criteria set forth by the DOH.

5. Write the letter of the best answer. It states that donations related to health and medicine fall under the jurisdiction of the DOH.
 - a) AO 2007-0015
 - b) AO 2007-0016
 - c) AO 2007-0017
 - d) AO 2007-0018
6. Give 2 implications of inappropriate donations.

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Disposal of Pharmaceuticals



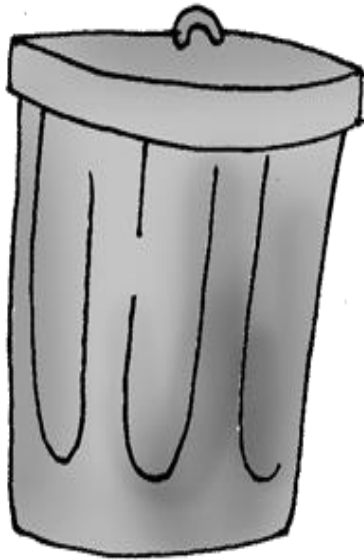
Learning Objectives:

At the end of the session, the learner should be able to:

- Discuss the importance of safe disposal for unwanted pharmaceuticals
- Explain the importance of sorting pharmaceuticals into categories that require different disposal methods
- Differentiate the various methods for disposing unwanted pharmaceuticals
- Identify the appropriate disposal method for a sorting category

Hospitals generate all sorts of hazardous waste, from sharps to materials contaminated with biological fluids to expired or damaged drugs. Improper drug disposal can result in contaminated water supplies, the resale of poor-quality drugs, and polluted air from improper incineration.

Often, hospitals can return products to the facility from where they were obtained. However, when that option is not available, a disposal plan should be in place and should be regularly monitored.

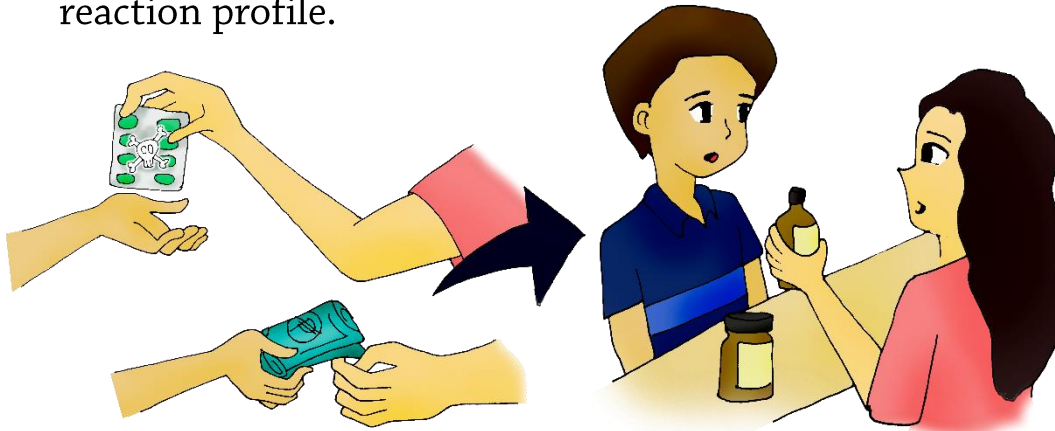


Disposal of small amounts of drug waste is easy and relatively cheap; large amounts require the use of special treatment facilities. Before a disposal technique is instituted, any government laws and regulations relevant to health care waste management and environmental protection should be reviewed.

Safe disposal of unwanted pharmaceuticals is a necessary task because of the possible threat to public health and the environment if improperly disposed of. The WHO Guidelines for Safe Disposal of Unwanted Pharmaceuticals in and after Emergencies list these threats as:

1. Contamination of water supplies or local sources used by nearby communities or wildlife;
2. Reduction or destruction of bacteria necessary for treatment of sewage when non-biodegradable antibiotics, anti-neoplastics and disinfectants are thrown into the sewage. Antineoplastics flushed into watercourses may damage aquatic life or contaminate drinking water.

3. Release of toxic pollutants into the air when burning pharmaceuticals at low temperatures or in open containers.
4. Diversion for resale of expired drugs to the general public due to inefficient and insecure sorting and disposal. Most pharmaceuticals past their expiry date become less efficacious and some may develop a different adverse drug reaction profile.



STEPS IN DISPOSAL

Disposal of unwanted pharmaceuticals may require a series of steps to be taken. Figure 7.1 outlines these steps.

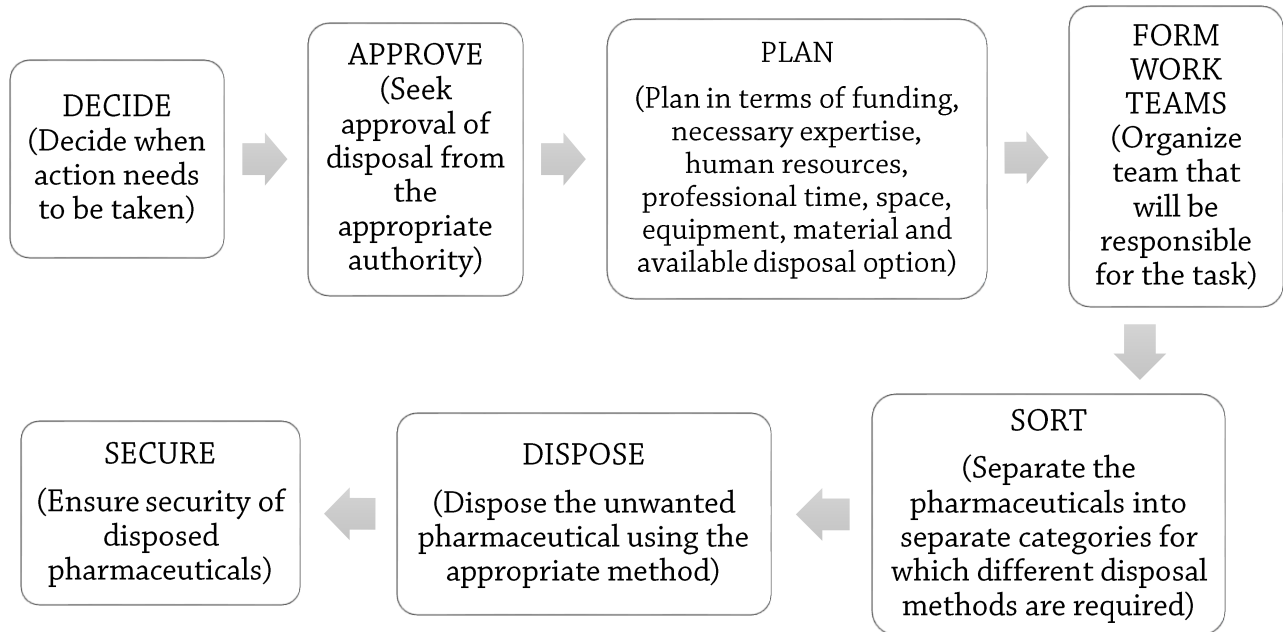


Figure 7.1. Steps in the proper disposal of unwanted pharmaceuticals

Source: Guidelines for Safe Disposal of Unwanted Pharmaceuticals in and after Emergencies, 1999

STEPS IN DISPOSAL

7

NOTE: Work teams should consist of supervising pharmacists and general medical workers, who are preferably pharmaceutical technicians or experienced pharmaceutical warehouse personnel. Health and safety of work teams must likewise be ensured by wearing appropriate protective equipment including overalls, boots, gloves, masks and caps when appropriate.



Sorting is to separate pharmaceuticals into categories that require disposal methods. The dosage form of the drug is a primary consideration in determining the appropriate safe disposal method. Segregated temporary storage areas must be provided for each sorted category.

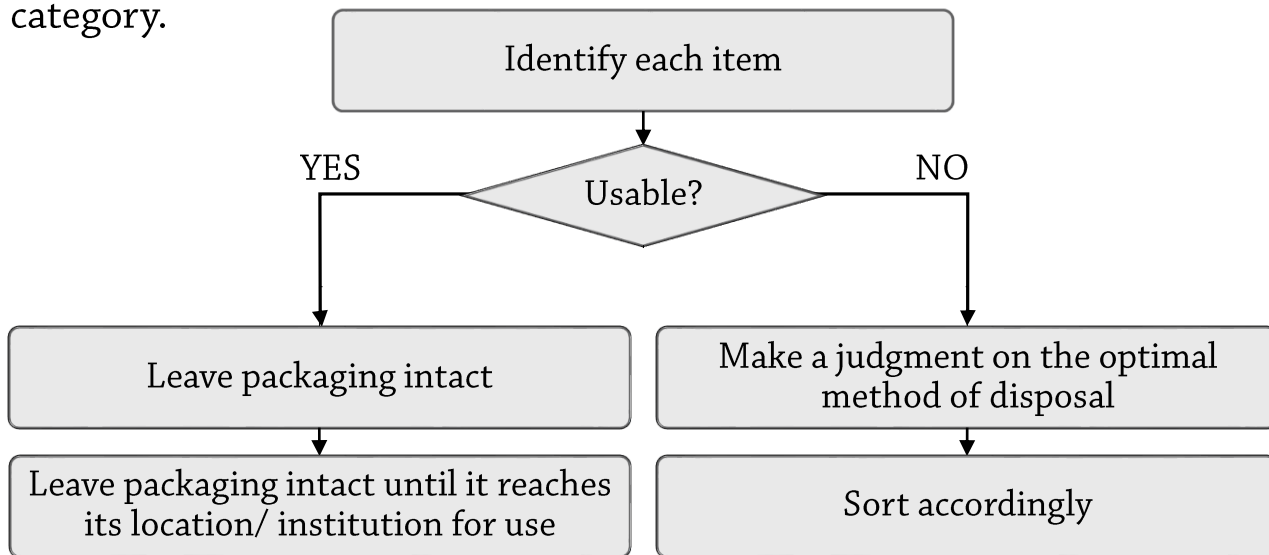


Figure 7.2. The sorting process

Sorting must be conducted in a well-ventilated, covered area. The staff performing the sorting process must be supplied with protective gear, have undergone proper training on the sorting criteria and health and safety risks associated with handling the materials, and should work under the direct supervision of a pharmacist. Once sorting is completed, the pharmaceuticals must be carefully packed into steel drums or into sturdy containers, labeled properly and stored in a dry, secure and preferably separate room (from other pharmaceuticals) until disposal is carried out.



There are several methods that can be employed to dispose unwanted pharmaceuticals. These methods have advantages and disadvantages and may be appropriate for specific types of pharmaceuticals only. As mentioned in previous section, the choice of disposal method must also take into consideration existing government law and regulation on healthcare waste management and environment protection.

The Philippine Clean Air Act (RA 8749) of 1999 sets the standards for environmental protection while pursuing national development. The law specifically bans the method of incineration for the disposal of waste, including medical and pharmaceutical wastes. This is in view of the amount of chemical pollutants that may be released into the atmosphere that could adversely affect humans, animals and vegetation. Because of this restriction of the law, the use of incineration, while accepted globally as a method of waste disposal, may not be considered as an acceptable method for disposing medicines in the Philippines.

I. Pharmaceutical Waste

It includes expired, unused, spilt, and contaminated pharmaceutical products, drugs, vaccines, and sera that are no longer required and need to be disposed of appropriately. The category also includes discarded items used in the handling of pharmaceuticals, such as bottles or boxes with residues, gloves, masks, connecting tubing, and drug vials.

A. Disposal of Small Quantities of Drug Waste

The disposal options for small quantities of drug waste include those outlined in the following paragraphs.

- *Landfill disposal.* Small quantities of drug waste produced on a daily basis may be landfilled provided that they are dispersed in large quantities of general waste. Cytotoxic and narcotic drugs, however, should never be landfilled, even in small quantities.
- *Encapsulation.* Small quantities of drug waste may be encapsulated, together with sharps if appropriate.
- *Safe burial on hospital premises.* Safe burial of small quantities of drug waste prevents scavenging and may be an appropriate disposal method for establishments applying minimal programmes.

- *Discharge to a sewer.* Moderate quantities of relatively mild liquid or semi-liquid drugs, such as solutions containing vitamins, cough syrups, intravenous solutions, eye drops, etc. (but not antibiotics or cytotoxic drugs), may be diluted in a large flow of water and discharged into municipal sewers. It is not acceptable, however, to discharge even small quantities of drug waste into slow-moving or stagnant water bodies
- *Incineration.* Small quantities of drug waste may be incinerated together with infectious or general waste, provided that they do not form more than 1% of the total waste (in order to limit potentially toxic emissions to the air).

B. Disposal of Large Quantities of Drug Waste

Large quantities of solid drug waste may have to be dealt with if a pharmacy closes down, or after emergencies. The treatment methods outlined in the following paragraphs are suitable.

- *Incineration.* The wastes should be mixed with their cardboard packaging, and possibly with other combustible material and infectious waste, to ensure optimal combustion conditions.

Low-temperature incineration ($<800^{\circ}\text{C}$), however, provides only limited treatment for this type of waste; it is not recommended unless it is followed by combustion in a second chamber, operating at temperatures about 1000°C , to burn off potentially toxic exhaust gases that may be produced.

Ideally, large amounts of drugs should be treated in incinerators designed for industrial waste (including rotary kilns), which can operate at high temperatures ($>1200^{\circ}\text{C}$). Cement kilns are also particularly suited to the treatment of drugs; in many countries, cement producers accept drug waste as an alternative fuel, thus reducing fuel costs. As a “rule of thumb”, however, it is suggested that no more than 5% of the fuel fed into the furnace at any time is pharmaceutical material.

- *Encapsulation.* Solid, liquid, and semi-liquid waste can be encapsulated in metal drums.

Landfilling of large quantities of drugs is not recommended unless the waste is encapsulated and disposed of in sanitary landfill sites, where the risk of groundwater contamination is minimized. Large amounts of drug waste should not be disposed of with general hospital waste, nor should they be diluted and discharged into sewers (except for certain very mild solutions, such as vitamin preparations).

Intravenous fluids and glass ampoules are special cases. Intravenous fluids (salts, amino acids, lipids, glucose, etc.), which are relatively harmless, can be disposed of to a landfill or discharged into a sewer. Ampoules should be crushed on a hard, impermeable surface; workers should wear protective clothing, eye protection, gloves, etc.

The glass should then be swept up, collected, and disposed of with sharps. Ampoules should not be incinerated as they may explode, damaging the incinerator or injuring workers.

II. Cytotoxic Waste

It is highly hazardous and should never be landfilled or discharged into the sewerage system. Disposal options include the following:

- *Return to original supplier.* Safely packaged but outdated drugs and drugs that are no longer needed should be returned to the supplier. This is currently the preferred option for countries that lack the facilities for incineration. Drugs that have been unpacked should be repackaged in a manner as similar as possible to the original packaging and marked “outdated” or “not for use”.

- *Incineration at high temperatures.* Full destruction of all cytotoxic substances may require temperatures up to 1200°C. Table 7.1 gives the minimum temperatures necessary to destroy common cytotoxic products. Incineration at lower temperatures may result in the release of hazardous cytotoxic vapors into the atmosphere.

Modern double-chamber pyrolytic incinerators are suitable, provided that a temperature of 1200°C with a minimum gas residence time of 5 seconds can be achieved in the second chamber. The incinerator should be fitted with gas-cleaning equipment. Incineration is also possible in rotary kilns designed for thermal decomposition of chemical wastes, in foundries, or in cement kilns, which usually have furnaces operating well in excess of 850°C. Incineration in most municipal incinerators, in single-chamber incinerators, or by open-air burning is inappropriate for the disposal of cytotoxic waste.

METHODS OF DISPOSAL

7

Table 7.1. Minimum temperatures for destruction of cytotoxic drugs

Drug	Temperature	Drug	Temperature
Aclarubicin	1000°C ^a	Etoposide	700°C ^a , 1000°C ^b
Amsacrine	>260°C ^a , 260°C ^b	5-Fluorouracil	700°C ^a , 1000°C ^b , 200°C ^c
Bleomycin	1000°C ^a	Idarubicin	700°C ^a
Carboplatin	1000°C ^a	Ifosfamide	1000°C ^a
Carmustine	1000°C ^{a,b}	Melphalan	500°C ^a
Chlormethine	800°C ^a	Methotrexate	1000°C ^{a,b}
Cisplatin	250°C ^b , 800°C ^a	Mithramycin	300°C ^b , 1000°C ^c
Cyclophosphamide	900°C ^a	Mitomycin	1000°C ^a
Cytarabine	1000°C ^a	Mitoxantrone	800°C ^a
Dacarbazine	500°C ^a	Plicamycin	1000°C ^a
Dactinomycin	1000°C ^a	Thiotepa	800°C ^{a,b}
Daunorubicin	700°C ^a , 800°C ^{b,c}	Vincristine	1000°C ^{a,b}
Doxorubicin	700°C ^a , >700°C ^c	Vindesine	1000°C ^{a,b}
Epirubicin	700°C ^{b,c}		

^aAllwood and Wright; ^bLee; ^cWilson

Source: Safe Management of Wastes from Health-care Activities, 1999

- *Chemical degradation.* Chemical degradation methods, which convert cytotoxic compounds into non-toxic/non-genotoxic compounds, can be used not only for drug residues but also for cleaning of contaminated urinals, spillages, and protective clothing. The methods are appropriate for developing countries. Most of these methods are relatively simple and safe; they include oxidation by potassium permanganate or sulfuric acid, denitrosation by hydrobromic acid, or reduction by nickel and aluminum. The methods are not appropriate for the treatment of contaminated body fluids.

Examples of cytotoxic drugs for which chemical degradation methods exist include:

- Carmustine
- Chlorambucil
- Chlormethine
- Chlorozotocin
- Cisplatin
- Cyclophosphamide
- Daunorubicin
- Dichloromethotrexate
- Doxorubicin
- Ifosfamide
- Lomustine
- Melphalan
- 6-Mercaptopurine
- Methotrexate
- PCNU (1-(2-Chloroethyl)-3-(2,6-dioxo-3-piperidyl)-1-nitrosourea)
- Procarbazine
- Semustine
- Spiromustine
- Streptozocin
- 6-Thioguanine
- Uramustine
- Vincristine sulfate
- Vinblastine sulfate

It should be noted that neither incineration nor chemical degradation currently provides a completely satisfactory solution for the treatment of waste, spillages, or biological fluids contaminated by antineoplastic agents. Until such a solution is available, hospitals should use the utmost care in the use and handling of cytotoxic drugs.

Where neither high-temperature incineration nor chemical degradation methods are available and where exportation of cytotoxic wastes for adequate treatment to a country with the necessary facilities and expertise is not possible, encapsulation or inertization may be considered as a last resort.

METHODS OF DISPOSAL

7

Table 7.2. Summary of disposal methods

Technology or Method	Pharmaceutical Waste	Cytotoxic Waste
Rotary kiln	Yes	Yes
Pyrolytic incinerator	Small quantities	No
Encapsulation	Yes	Small quantities
Safe burial on hospital premises	Small quantities	No
Sanitary landfill	Small quantities	No
Discharge to sewer	Small quantities	No
Inertization	Yes	Yes
Other methods	Return expired drugs to supplier	Return expired drugs to supplier

Source: Safe Management of Wastes from Health-care Activities, 1999

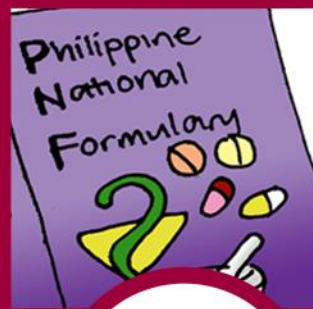
Write T if the statement is true and F if the statement is false.

1. Improper disposal of expired pharmaceuticals may pose a threat to public health of the environment.
2. All liquid pharmaceutical preparations maybe disposed into the sewer but require dilution prior to disposal.
3. The dosage form of the drug is a primary consideration in determining the appropriate disposal method.
4. Cytotoxic and narcotic drugs should never be landfilled, even in small quantities.
5. Chemical degradation methods convert cytotoxic compounds into less toxic compounds.

MANAGEMENT SCIENCES FOR HEALTH, INC. 2012. *Managing Access to Medicines and Health Technologies*. [online]. [Accessed 10 November 2014]. Available from: <<http://www.msh.org/sites/msh.org/files/mds3-jan2014.pdf>>

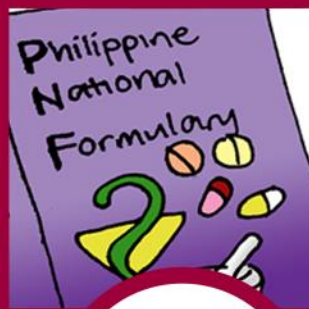
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Training Manual on Pharmaceutical Supply Chain Management

PARTICIPANT'S MANUAL
for Government Hospitals



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Training Manual on Pharmaceutical Supply Chain Management

PARTICIPANT'S MANUAL
for Government Hospitals

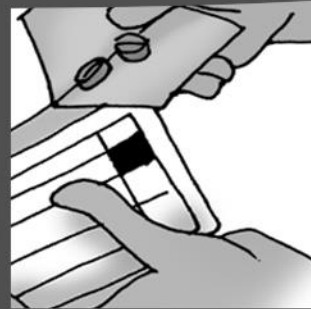




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Glossary of Abbreviations

H

ADE Adverse Drug Event

FDA Food and Drug Administration

ADORS Adverse Drug Online Reporting System

FEC Formulary Executive Council

ADR Adverse Drug Reaction

FEFO First Expiry, First Out

AO Administrative Order

FIFO First In, First Out

BAC Bids and Awards Committee

GMP Good Manufacturing Practice

BHS Barangay Health Stations

INN International Nonproprietary Name

CHO City Health Office

LGU Local Government Unit

DOH Department of Health

MHO Municipal Health Office

EO Executive Order

FEC Formulary Executive Council

Glossary of Abbreviations

NCCMERP	National Coordinating Council for Medication Error Reporting and Prevention	PVC	Polyvinyl Chloride
NCPAM	National Center for Pharmaceutical Access and Management	RA	Republic Act
OTC	Over-the-Counter	RH	Relative Humidity
SALADs	Sound-alike look-alike drugs	RHU	Rural Health Unit
PNDF	Philippine National Drug Formulary	RI	Request Indicator
PNF	Philippine National Formulary	USP	United States Pharmacopeia
PTC	Pharmacy and Therapeutics Committee	WHO	World Health Organization