THE PHARMACY TECHNICIAN

SEVENTH EDITION

APhA

AMERICAN PHARMACISTS ASSOCIATION

Basic Pharmacy & Pharmacology Series

Perspective Press

The Pharmacy Technician

Seventh Edition

Morton Publishing Company
www.morton-pub.com

Morton Publishing

Seventh Edition

Printed in the United States of America.

Morton Publishing Company
925 West Kenyon Avenue, Unit 12
Englewood, CO 80110
phone: 1-303-761-4805
fax: 1-303-762-9923
www.morton-pub.com

International Standard Book Number

ISBN: 9781640431386
(ISBN-10: 1640431381)

10 9 8 7 6 5 4 3 2 1

Library of Congress Control Number: 2019957161

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NOTICE

To the best of the Publisher's knowledge, the information presented in this book follows general practice as well as federal and state regulations and guidelines. However, please note that you are responsible for following your employer's and your state's policies and guidelines.

The job description for pharmacy technicians varies by institution and state. Your employer and state can provide you with the most recent regulations, guidelines, and practices that apply to your work.

The Publisher of this book disclaims any responsibility whatsoever for any injuries, damages, or other conditions that result from your practice of the skills described in this book for any reason whatsoever.

For Joanie and Hannah

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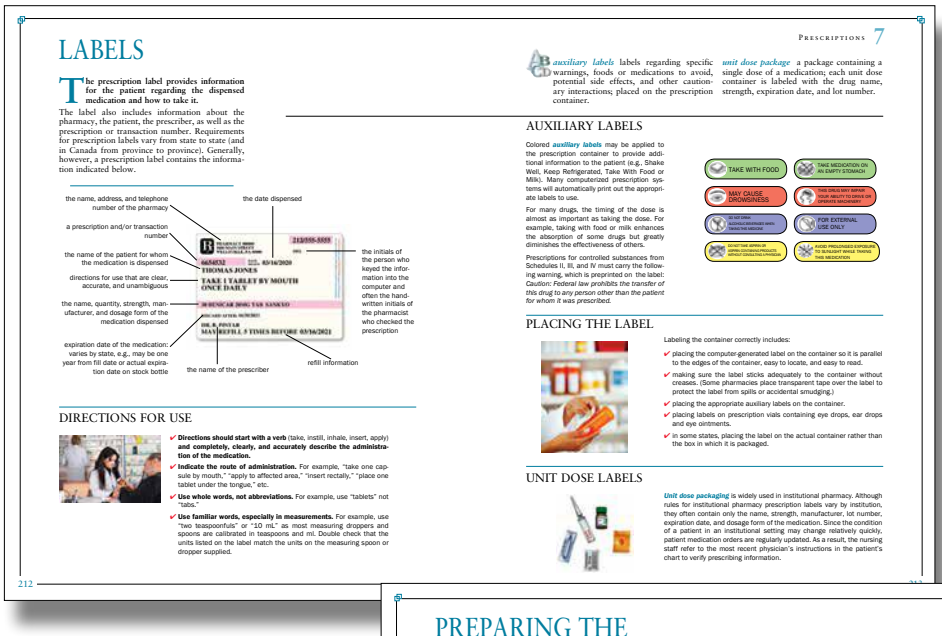
A Quick Look...

The Pharmacy Technician and ***The Pharmacy Technician Workbook & Certification Review*** have successfully supported the training of hundreds of thousands of practicing pharmacy technicians and are officially endorsed by the American Pharmacists Association (APhA). The following offers a quick introduction to the text and its features.

The Pharmacy Technician has been designed and developed to make learning easier and more productive. It provides clear, practical, and *visual* coverage of a broad range of topics.

- ✔ While this book presents many important concepts for pharmacy technicians, it focuses on *pharmacy technician practice*.
- ✔ Topics are presented in visual layouts across two page "spreads" that *bring technician practice to life*.
- ✔ The distinctive, facing-page design makes it *easier to learn and understand concepts*.



LABELS

The prescription label provides information for the patient regarding the dispensed medication and how to take it.

The label also includes information about the pharmacy, the patient, the prescriber, as well as the prescription or transaction number. Requirements for prescription labels vary from state to state (and in Canada from province to province). Generally, however, a prescription label contains the information indicated below.

the name, address, and telephone number of the pharmacy
a prescription and/or transaction number
the name of the patient for whom the medication is dispensed
directions for use that are clear, accurate, and unambiguous
the name, quantity, strength, manufacturer, and dosage form of the medication dispensed
expiration date of the medication: varies by state, e.g., may be one year from fill date or actual expiration date on stock bottle
the date dispensed
the initials of the person who keyed the information into the computer and often the handwritten initials of the pharmacist who checked the prescription
the name of the prescriber
refill information

DIRECTIONS FOR USE

- ✔ **Directions should start with a verb** (take, instill, inhale, insert, apply) **and completely, clearly, and accurately describe the administration of the medication.**
- ✔ **Indicate the route of administration.** For example, "take one capsule by mouth," "apply to affected area," "insert rectally," "place one tablet under the tongue," etc.
- ✔ **Use whole words, not abbreviations.** For example, use "tablets" not "tabs."
- ✔ **Use familiar words, especially in measurements.** For example, use "two teaspoonfuls" or "10 mL" as most measuring droppers and spoons are calibrated in teaspoons and mL. Double check that the units listed on the label match the units on the measuring spoon or dropper supplied.

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Prescriptions 7

auxiliary labels labels regarding specific warnings, foods or medications to avoid, potential side effects, and other cautionary interactions; placed on the prescription container.

unit dose package a package containing a single dose of a medication; each unit dose container is labeled with the drug name, strength, expiration date, and lot number.

AUXILIARY LABELS

Colored ***auxiliary labels*** may be applied to the prescription container to provide additional information to the patient (e.g., Shake Well, Keep Refrigerated, Take With Food or Milk). Many computerized prescription systems will automatically print out the appropriate labels to use.

For many drugs, the timing of the dose is almost as important as taking the dose. For example, taking with food or milk enhances the absorption of some drugs but greatly diminishes the effectiveness of others.

Prescriptions for controlled substances from Schedules II, III, and IV must carry the following warning, which is preprinted on the label: *Caution: Federal law prohibits the transfer of this drug to any person other than the patient for whom it was prescribed.*

TAKE WITH FOOD
TAKE MEDICATION ON AN EMPTY STOMACH
MAY CAUSE DROWSINESS
FOR EXTERNAL USE ONLY

PLACING THE LABEL

Labeling the container correctly includes:

- ✔ placing the computer-generated label on the container so it is parallel to the edges of the container, easy to locate, and easy to read.
- ✔ making sure the label sticks adequately to the container without creases. (Some pharmacies place transparent tape over the label to protect the label from spills or accidental smudging.)
- ✔ placing the appropriate auxiliary labels on the container.
- ✔ placing labels on prescription vials containing eye drops, ear drops and eye ointments.
- ✔ in some states, placing the label on the actual container rather than the box in which it is packaged.

UNIT DOSE LABELS

Unit dose packaging is widely used in institutional pharmacy. Although rules for institutional pharmacy prescription labels vary by institution, they often contain only the name, strength, manufacturer, lot number, expiration date, and dosage form of the medication. Since the condition of a patient in an institutional setting may change relatively quickly, patient medication orders are regularly updated. As a result, the nursing staff refer to the most recent physician's instructions in the patient's chart to verify prescribing information.

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- ✔ Photography, illustration and text are integrated in topic discussions to clarify concepts and reinforce understanding.

PREPARING THE PRESCRIPTION

Once the patient and prescription information has been correctly entered into the computer system, there are several steps in preparing the prescription.

These include generating the label; retrieving the correct medication from stock; counting, measuring, and otherwise preparing the medication; placing the prescription label on the container; and organizing the prescription and medication for final check by the pharmacist.

GENERATING THE PRESCRIPTION LABEL AND RETRIEVING THE PRODUCT

NDC number

After the prescription information has been entered into the system, the computer will generate a label. The label will include the product's National Drug Code (NDC), which is an 11-digit number unique not only to the drug but also to its particular strength and form. Scanning the NDC number on the drug product selected from the stock shelves, or checking it manually, will confirm that it is the same as the prescribed product.

CONTAINERS

Pills and tablets are usually placed in plastic amber containers while liquids are poured into glass amber bottles. The dark amber color is designed to protect the drug from light, which can adversely affect the quality and effectiveness of some drugs.

Generally, all prescription vials and bottles must have a ***safety cap*** or child resistant cap. Some exceptions are prepackaged products such as sublingual nitroglycerin and "dosepaks" such as Medrol Dosepak and Z-Pak. Patients may, however, request an easy-open cap instead of a safety cap. Most computer systems have a field for recording the patient's preference. It is important to pay attention to which cap is indicated because some elderly or arthritic patients have extreme difficulty opening child-resistant caps.

Creams and ointments that are not prepackaged, such as compounded formulations, are transferred with a spatula to an ointment jar of the correct size.

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counting tray a tray designed for counting pills from a stock bottle into a prescription vial.
safety cap a child-resistant cap.

COUNTING CAPSULES & TABLETS

One way to count capsules and tablets is using a ***counting tray.***

Using this method, place several pills or tablets on a counting tray and use a spatula to move pills two, three, or five at a time into the cylinder on the left until reaching the correct number. Then return the extra pills to the stock bottle via the guide at the top right of the tray. Finally, slide the pills from the cylinder into the appropriately sized prescription vial.

Automatic pill counting devices are frequently used to help count medications. Pill counters like the Kirby Lester KL1 (shown at left) are more accurate and usually much faster than using a counting tray. To use this type of device, pour the tablets or capsules through the top funnel of the pill counter, which records the number of pieces falling through. When the desired quantity is filled, transfer the counted medications into the appropriately sized vial.

First scan the prescription label,

then scan the stock bottle to confirm a match.

Many pharmacies have enforced a process known as "scan-verification" along with counting to ensure the correct medication, dosage, and quantity is filled for each patient. Using a device such as the Kirby Lester KL1Plus, first scan the barcode on the prescription label that has been generated by the pharmacy's management system. This bar code contains the patient's unique Rx number, the NDC of the correct medication, and the number of tablets or capsules to count. Then scan the stock bottle's UPC bar code to verify it matches the prescribed drug. Finally, count the correct number of capsules or tablets through the device as described above. The software keeps a record of each filled prescription.

(Images courtesy Kirby-Lester, LLC)

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- ✔ Concepts are presented through their application, and often through step-by-step procedures.

- ✔ A running "ABCD" glossary defines all the key terms on each spread.
- ✔ Corresponding key terms are highlighted in ***bold aqua italics*** where they appear in the text discussion.

COMPUTERS IN PHARMACY

PHARMACY & HEALTH CARE 1

Pharmacies use computerized management systems to put customer profiles, product, inventory, pricing, and other essential information within easy access.

These systems also automate elements like label printing, inventory management, stock reordering, and billing. As a result, pharmacies and pharmacists dispense more prescriptions and information than ever before.

Pharmacy computer systems may be developed by the user to meet specific needs, be purchased ready-made, or provided by a drug wholesaler.

Wholesalers provide inventory management systems to their customers as part of their service. The wholesaler actually owns the system, which is primarily designed for placing orders with the wholesaler, though it may also contain various other features. Large pharmacy chains have the business volume to justify the expense of developing comprehensive systems that are tailored to their needs. Smaller operations usually buy a commercially available system. Whatever the operation, a computerized pharmacy management system is an indispensable productivity tool.

Although each pharmacy computer system has its own specific features, many general principles of computer usage apply to all systems.

The most important element is stated in the classic computer axiom: garbage in, garbage out. That is, the information produced by the computer is only as good as the information that is entered into it. This means special care has to be taken when entering information (generally called *data*) to make sure it is correct. A simple mistake in data entry can result in the wrong medication being given to the wrong patient or any number of other serious problems.

In addition to traditional computers, pharmacies are increasingly using portable handheld digital devices such as tablets and smartphones.

These portable devices are especially useful for accessing drug information from online references as well as from specific software programs, applications, and apps.

data information that is entered into and stored in a computer system.

A SAMPLE COMPUTER SYSTEM

Pharmacy computer systems generally offer most or all of these features, and may offer others as well.

Patient Profile
Provides complete information about patients, including prescribers, insurer, medication history, and medical history, including allergies; identifies drug interactions for patients taking multiple medications.

Billing
Checks policies of third parties such as HMOs and insurers; authorizes third-party transactions and credit cards electronically.

Management Reporting
Used for forecasting and financial analysis.

Prescriber Profile
Includes state identification numbers and affiliations with facilities and insurers.

Education
Provides information for the patient about drugs, usage, interactions, allergies, etc.

Product Selection
Locates items by various means (brand name, generic name, product code, category, supplier, etc.). Gives updates of prices and other product information.

Photo courtesy Dell, Inc.

Inventory
Adjusts inventory as prescriptions are filled; analyzes turnover; produces status reports; automatically reorders based on inventory levels; generates purchase orders.

Pricing
Provides prices for medications ...le substitutes; auto-...odates prices; scans ...bar codes.

Security
Password protection restricts access to authorized users for different features.

Labeling
Creates label, receipt, customer information, and usage instructions.

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ASEPTIC TECHNIQUES FOR COMPOUNDING CSPs

STERILE COMPOUNDING & ASEPTIC TECHNIQUES 10

WHY ASEPTIC TECHNIQUES ARE NECESSARY

Working in a PEC does not by itself guarantee a sterile compounded preparation. PECs provide a controlled air environment that ensures surfaces used to compound CSP are ultraclean, but the PEC does not provide a sterile environment.

Aseptic techniques are the methods used to minimize the potential of particle and microbial contamination of CSPs. These techniques address requirements for ensuring the PEC is properly functioning, garbing (wearing protective clothing over personal clothing), proper hand hygiene, preparing supplies, mixing and manipulating preparations inside the PEC device or clean room, checking the final preparation, disposing of compounding materials, and cleaning the compounding area after all compounding operations are complete.

Remember that each PEC has its own unique operating procedures. Examples include when to turn on a device before compounding and/or what parameters should be monitored if the device is in continuous operation. There are also manufacturer and institutional requirements for PEC operation that must be understood and followed.

GARBING

When preparing to work in a PEC, the technician should first put on appropriate clothing called "garb." Garbing includes shoe covers, hair bonnets (and beard guards, if applicable), gowns, gloves, and handwashing. These tasks should be completed by covering up from the dirtiest to the cleanest part of one's body. Obviously, dirtiest and cleanest parts are relative terms.

After garbing, the technician carries out any procedures that must be completed in the PEC before compounding begins. Then the technician prepares all the supplies that will be needed and moves them into the PEC.

1. Put On Shoe Covers, Hair Bonnet, Mask, and Gown

✔ Remove all jewelry.
✔ Put on shoe covers.
✔ Put on hair bonnet.
✔ Put on mask.
✔ Put on gown and

2. Wash Hands

One of the most important ways to minimize contamination is to properly wash hands, following the steps below.

✔ Stand far enough away from the sink so clothing does not come in contact with it.
✔ Turn on water. Wet hands and forearms thoroughly. Keep hands pointed downward.
✔ Scrub hands vigorously with an antibacterial soap.
✔ Work soap under fingernails by rubbing them against the palm of the other hand.
✔ Interlace the fingers and scrub the spaces between the fingers.
✔ Wash wrists and arms up to the elbows with arms pointed upward.
✔ Thoroughly rinse the soap from hands and arms with arms pointed upward.
✔ Dry hands and forearms thoroughly using a non-shedding paper towel, with arms pointed upward.
✔ Use a dry paper towel to turn off the water faucet.
✔ After hands are washed, avoid touching clothes, face, hair, or any other potentially contaminated object in the area.

3. Put On Sterile Gloves

✔ First, spray your hands with sterile 70% isopropyl alcohol. Allow the alcohol to dry.
✔ Then put on sterile gloves, making sure the glove covers the sleeve of the gown.
✔ Finally, spray both gloves with sterile 70% isopropyl alcohol.

Rx safety you should know

✔ PECs provide an ultraclean environment but do not provide a sterile environment.

...from the environ-...net. Airflow work-stations, safety cabinets and clean rooms control the environment; personnel using aseptic techniques control contamination from personnel.

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- ✔ Safety is emphasized throughout, with Rx Safety notes and Rx Tips highlighting and emphasizing important information.

THE FILL PROCESS (cont'd)

DAYS SUPPLY

Simply stated, ***days supply*** is the number of days the prescribed quantity of medication will last when taken as directed. So if a patient is to take one tablet a day and the quantity is 30 tablets, the medication will last 30 days.

Understanding the days supply concept when entering a prescription into a computer for third-party processing is key to successful reimbursement. Insurance companies determine "next fill" dates based on the last fill date and the days supply for the last fill. They typically allow a refill once 75% of the previous fill's days supply has been reached. (For a 30-day fill, this would be one week early.) This ensures patients will have sufficient quantities on hand to prevent interruption of therapy.

Submitting an incorrect days supply could cause the insurance company to deny a refill even when it should be allowed. For instance, a prescription written for 90 tablets to be taken 3 times a day could be mistakenly interpreted as a 90-day supply when it is actually a 30-day supply: 90 tablets divided by 3 tablets/day is 30 days. If the days supply is entered as 90, the insurance company will not allow a refill before 90 days when the patient should be allowed a refill in 30 days. Entering an incorrect days supply could also result in an audit of pharmacy claims, reversal of payment by third-party insurers, and even legal action if fraud or abuse is suspected.

Example—Days Supply I

A customer gives you a prescription for metformin 500 mg i tab tid po #270.

What is the days supply?

i tab tid means take one tablet three times a day

270 tablets @ 3 tablets/day = 90-day supply

For some prescriptions, days supply is more difficult to calculate. For instance, APAP (acetaminophen) may be prescribed "as needed" but also has an FDA maximum dose per day since it is toxic to the liver in doses exceeding 4 grams per day.

Example—Days Supply II

A customer gives you a prescription for hydrocodone 10 mg / APAP 325 mg i - ii tab q 3-4 h prn pain, quantity 120.

What is the days supply?

i - ii tab q 3-4 h prn means 1 or 2 tablets every 3–4 hours as needed.

The maximum dose per the prescriber's instructions is 2 tablets 8 times a day, or 16 tablets per day, and a days supply of 7.5 days.

The maximum dose for APAP per FDA guidelines is 4 g per day. Therefore the maximum number of tablets per day for a dosage form with 325 mg APAP per tablet is 12 tablets per day. The days supply is 10 days.

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- ✔ Integrated example calculation problems with step-by-step solutions throughout the text support learning and applying math in context.

and more on next page...

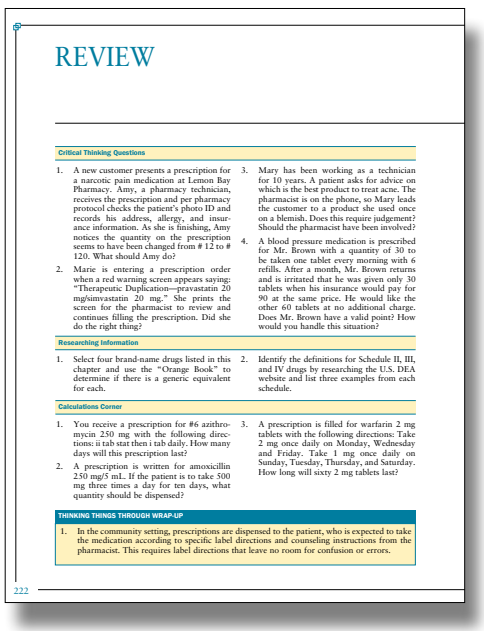
End of Chapter Reviews

At the end of each chapter, there is an extensive review section that includes:

- ✔ ***Key Concepts*** checklists
- ✔ ***Self Test*** sections with multiple exercise formats
- ✔ ***Critical Thinking*** questions that apply knowledge and understanding
- ✔ ***Researching Information*** exercises that require using resources discussed in the *Information* chapter and that support lifelong learning
- ✔ ***Thinking Things Through Wrap-Up*** to the case scenario that begins each chapter and prompts applying knowledge to the topics presented in the chapter
- ✔ ***Calculations Corner*** sections in Chapters 6–18 that reinforce math skills in the context of the chapter topic

and

- ✔ ***Practicing for the Certification Exam*** sections that quiz students on topics covered on the PTCE and ExCPT blueprints



REVIEW

Critical Thinking Questions

1. A new customer presents a prescription for a narcotic pain medication at Lemon Bay Pharmacy. Amy, a pharmacy technician, receives the prescription and per pharmacy protocol checks the patient's photo ID and records his address, allergy, and insurance information. As she is finishing, Amy notices the quantity on the prescription seems to have been changed from # 12 to # 120. What should Amy do?
2. Marie is entering a prescription order when a red warning screen appears saying: "Therapeutic Duplication—pravastatin 20 mg/simvastatin 20 mg." She prints the screen for the pharmacist to review and continues filling the prescription. Did she do the right thing?
3. Mary has been working as a technician for 10 years. A patient asks for advice on which is the best product to treat acne. The pharmacist is on the phone, so Mary leads the customer to a product she used once on a blemish. Does this require judgement? Should the pharmacist have been involved?
4. A blood pressure medication is prescribed for Mr. Brown with a quantity of 30 to be taken one tablet every morning with 6 refills. After a month, Mr. Brown returns and is irritated that he was given only 30 tablets when his insurance would pay for 90 at the same price. He would like the other 60 tablets at no additional charge. Does Mr. Brown have a valid point? How would you handle this situation?

Researching Information

1. Select four brand-name drugs listed in this chapter and use the "Orange Book" to determine if there is a generic equivalent for each.
2. Identify the definitions for Schedule II, III, and IV drugs by researching the U.S. DEA website and list three examples from each schedule.

Calculations Corner

1. You receive a prescription for #6 azithromycin 250 mg with the following directions: ii tab stat then i tab daily. How many days will this prescription last?
2. A prescriber is written for amoxicillin 250 mg/5 mL. If the patient is to take 500 mg three times a day for ten days, what quantity should be dispensed?
3. A prescription is filled for warfarin 2 mg tablets with the following directions: Take 2 mg once daily on Monday, Wednesday and Friday. Take 1 mg once daily on Sunday, Tuesday, Thursday, and Saturday. How long will sixty 2 mg tablets last?

THINKING THINGS THROUGH WRAP-UP

1. In the community setting, prescriptions are dispensed to the patient, who is expected to take the medication according to specific label directions and counseling instructions from the pharmacist. This requires label directions that leave no room for confusion or errors.

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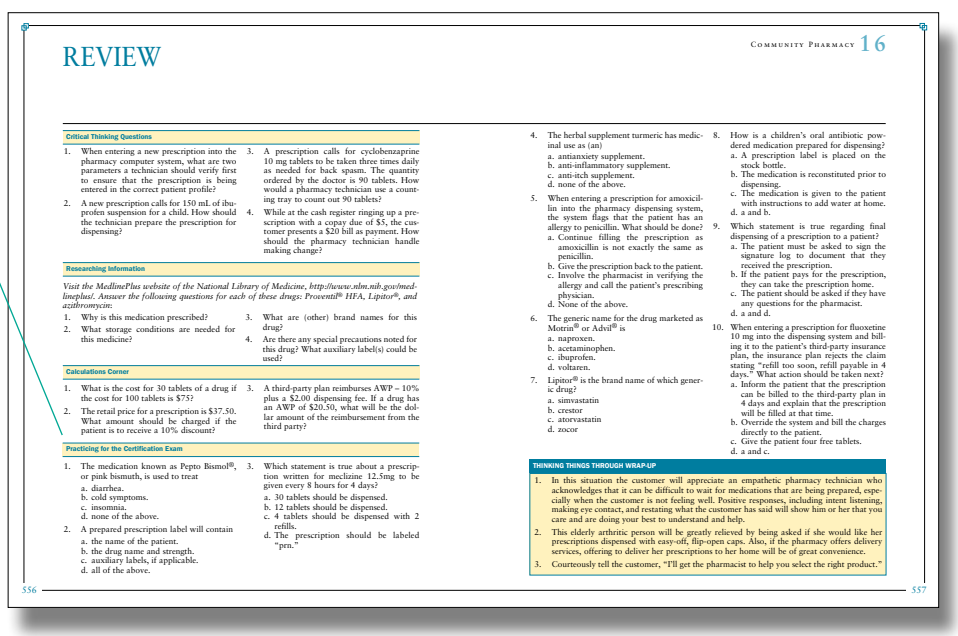

REVIEW

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Critical Thinking Questions

1. When entering a new prescription into the pharmacy computer system, what are two parameters a technician should verify first to ensure that the prescription is being entered in the correct patient profile?
2. A new prescription calls for 150 mL of ibuprofen suspension for a child. How should the technician prepare the prescription for dispensing?
3. A prescription calls for cyclobenzaprine 10 mg tablets to be taken three times daily as needed for back spasm. The quantity ordered by the doctor is 90 tablets. How would a pharmacy technician use a counting tray to count out 90 tablets?
4. While at the cash register ringing up a prescription with a copay due of $5, the customer presents a $20 bill as payment. How should the pharmacy technician handle making change?

Researching Information

Visit the MedlinePlus website of the National Library of Medicine, http://www.nlm.nih.gov/medlineplus/. Answer the following questions for each of these drugs: Proventil® HFA, Lipitor®, and azithromycin:

1. Why is this medication prescribed?
2. What storage conditions are needed for this medicine?
3. What are (other) brand names for this drug?
4. Are there any special precautions noted for this drug? What auxiliary label(s) could be used?

Calculations Corner

1. What is the cost for 30 tablets of a drug if the cost for 100 tablets is $75?
2. The retail price for a prescription is $37.50. What amount should be charged if the patient is to receive a 10% discount?
3. A third-party plan reimburses AWP – 10% plus a $2.00 dispensing fee. If a drug has an AWP of $20.50, what will be the dollar amount of the reimbursement from the third party?

Practicing for the Certification Exam

1. The medication known as Pepto Bismol®, or pink bismuth, is used to treat
   a. diarrhea.
   b. cold symptoms.
   c. insomnia.
   d. none of the above.
2. A prepared prescription label will contain
   a. the name of the patient.
   b. the drug name and strength.
   c. auxiliary labels, if applicable.
   d. all of the above.
3. Which statement is true about a prescription written for meclizine 12.5mg to be given every 8 hours for 4 days?
   a. 30 tablets should be dispensed.
   b. 12 tablets should be dispensed.
   c. 4 tablets should be dispensed with 2 refills.
   d. The prescription should be labeled "prn."
4. The herbal supplement turmeric has medicinal use as (an)
   a. antianxiety supplement.
   b. anti-inflammatory supplement.
   c. anti-itch supplement.
   d. none of the above.
5. When entering a prescription for amoxicillin into the pharmacy dispensing system, the system flags that the patient has an allergy to penicillin. What should be done?
   a. Continue filling the prescription as amoxicillin is not exactly the same as penicillin.
   b. Give the prescription back to the patient.
   c. Involve the pharmacist in verifying the allergy and call the patient's prescribing physician.
   d. None of the above.
6. The generic name for the drug marketed as Motrin® or Advil® is
   a. naproxen.
   b. acetaminophen.
   c. ibuprofen.
   d. voltaren.
7. Lipitor® is the brand name of which generic drug?
   a. simvastatin
   b. crestor
   c. atorvastatin
   d. zocor
8. How is a children's oral antibiotic powdered medication prepared for dispensing?
   a. A prescription label is placed on the stock bottle.
   b. The medication is reconstituted prior to dispensing.
   c. The medication is given to the patient with instructions to add water at home.
   d. a and b.
9. Which statement is true regarding final dispensing of a prescription to a patient?
   a. The patient must be asked to sign the signature log to document that they received the prescription.
   b. If the patient pays for the prescription, they can take the prescription home.
   c. The patient should be asked if they have any questions for the pharmacist.
   d. a and d.
10. When entering a prescription for fluoxetine 10 mg into the dispensing system and billing it to the patient's third-party insurance plan, the insurance plan rejects the claim stating "refill too soon, refill payable in 4 days." What action should be taken next?
    a. Inform the patient that the prescription can be billed to the third-party plan in 4 days and explain that the prescription will be filled at that time.
    b. Override the system and bill the charges directly to the patient.
    c. Give the patient four free tablets.
    d. a and c.

THINKING THINGS THROUGH WRAP-UP

1. In this situation the customer will appreciate an empathetic pharmacy technician who acknowledges that it can be difficult to wait for medications that are being prepared, especially when the customer is not feeling well. Positive responses, including intent listening, making eye contact, and restating what the customer has said will show him or her that you care and are doing your best to understand and help.
2. This elderly arthritic person will be greatly relieved by being asked if she would like her prescriptions dispensed with easy-off, flip-open caps. Also, if the pharmacy offers delivery services, offering to deliver her prescriptions to her home will be of great convenience.
3. Courteously tell the customer, "I'll get the pharmacist to help you select the right product."

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Preface

Through its first six editions, *The Pharmacy Technician* has been widely used to prepare hundreds of thousands of aspiring pharmacy technicians for a rewarding and dynamic career in pharmacy. In keeping with this history, as well as with the constantly changing field of pharmacy, the *Seventh Edition* of *The Pharmacy Technician* maintains the organization, features, and core content of the previous edition, but has been extensively revised and updated throughout. In particular, the *Seventh Edition* reflects the 2018 revision of the *American Society of Health-System Pharmacists (ASHP) Model Curriculum for Pharmacy Technician Education and Training Programs* (see Appendix D), the input of numerous users of the 6th (and prior) edition(s), and the latest information available in the field.

Following the *ASHP Model Curriculum*, this edition provides a broad introduction for both entry and advanced level technicians. For aspiring technicians whose focus is at the entry level, we believe they will find this a practical and useful text that gets them off to a fast start in their career. We also think they will find that the presentation of advanced topics like compounding is accessible and easily understood and provides an additional useful career perspective. Our goal throughout has been to provide a valuable tool for both entry and advanced level training.

As with the previous edition, the *Seventh Edition* is organized into the following sections:

I. Foundations, Chapters 1–7;

II. Compounding & Pharmacology, Chapters 8–13

III. Business & Practice Settings, Chapters 14–18

The distinctive visual two-page spread approach of this text is designed for ease of learning, and users of the previous editions have repeatedly cited that feature as a benefit. We have maintained that, as well as the book's overall structure, but have made a concerted effort to streamline and improve the content presentation for comprehension and usefulness. We think this has resulted in an improved text that is also slightly shorter in length (about 4%).

In addition to the *Seventh Edition's* comprehensive and practical coverage and distinctive visual presentation, students will encounter: a) a thorough introduction to the learning and reference tools that are an integral part of a successful career as a pharmacy technician; b) a standalone, in-depth presentation of calculations, along with integrated, in-context calculation examples and problems at the end of most chapters; and c) an emphasis on safety practices throughout.

For example, students will find extensive coverage of the most important publications in the field along with key digital resources and information on how to access both. They will find multiple worked-out examples of calculation topics such as determining prescription selling prices, days supply, IV flow rate, and so on, in the chapters that cover those areas. They will also find extensive coverage on safety throughout the text in discussions of look-alike/sound-alike drugs, the TJC list of "Do Not Use" error-prone abbreviations, practices for filling prescriptions, and so on.

Like previous editions, the *Seventh Edition* has a substantial number and variety of end-of-chapter exercises. There are numerous questions designed to reinforce understanding of the content, Critical Thinking questions designed to apply that understanding, and Practicing for the Certification Exam multiple-choice questions to help prepare technicians for the certification exam. To facilitate self-study, the answers to all questions are in the Answer Key beginning on p. 643. We hope these and the many other features of the *Seventh Edition* help to provide a great learning experience.

Dennis Hogan
Publisher

A Word About The Companion Workbook

The Pharmacy Technician Workbook and Certification Review, Seventh Edition, is designed to accompany this text and provide a more complete learning experience. The *Workbook* offers hundreds of carefully explained key terms and concepts and over 1,000 exercises and problems for self-testing. *In the Workplace* sections provide sample job-related documents, skills checklists, and activities.

Following the chapters are 15 labs organized by drug classifications. Each lab consists of a drug card activity, a series of web-research activities, and, starting with the fourth lab, prescription label preparation activities, all on drugs in that classification. The first three labs also provide foundational activities that support concepts presented in Chapters 1–3 of *The Pharmacy Technician*.

The *Workbook* can be used in preparation for national certification exams such as the *Pharmacy Technician Certification Exam (PTCE)* and the *Exam for Certification of Pharmacy Technicians (ExCPT)*. It provides two certification practice exams, one in the format of the *PTCE* and one in the format of the *ExCPT*. In addition, the *Workbook* contains a *Calculations Practice Exam* for practice in solving quantitative problems on the certification exams.

Acknowledgments

Contributors

First, I would like to especially thank and acknowledge our two leading contributors and *Consulting Editors*, Mary F. Powers and David R. Bright. Besides being responsible as contributors for over half of this text, they have also consulted and advised on the text as a whole. Their expertise and their productivity were invaluable in developing this edition.

Mary F. Powers, Ph.D., R.Ph., Professor and Associate Dean, University of Toledo College of Pharmacy & Pharmaceutical Sciences

Mary developed the *Financial Issues* and *Calculations* chapters, and revised Chapters 1–3 and 18. Mary is also the author of the Workbook accompanying this text. As always, Mary provided help and feedback throughout the development of the entire project, including introducing us to David, for all of which we are very grateful.

David R. Bright, PharmD, MBA, BCACP, Associate Professor, Pharmaceutical Science, Ferris State University

David joined *The Pharmacy Technician* for the *Seventh Edition*. He revised Chapters 4, 7, 13, and 14, and advised on much of the rest of the book. David has served on the Certification Council for the Pharmacy Technician Certification Board since 2012, and he has been instrumental in focusing this text on current technician practice.

In addition to Mary and David, I would also like to thank the following people for their contributions to this book over many editions:

Robert P. Shrewsbury, Ph.D., R.Ph., Associate Professor, Division of Pharmacy Advancement and Clinical Education, Eshelman School of Pharmacy, University of North Carolina-Chapel Hill; member of the USP Expert Committee on Compounding

Bob developed Chapters 5 and 8 through 12, prepared the appendix on *Commonly Refrigerated Drugs*, and provided extensive photography.

Ruth Gilman, Pharm.D., Pharmacist, CVS Pharmacy

Ruth developed the *Community Pharmacy* chapter and provided many photographs used throughout the book.

Pamela Nicoski-Lenaghan, Pharm.D., BCPS, Clinical Pharmacist, Loyola University Medical Center, and Britta Young, Pharm.D., Clinical Pharmacist, Ann & Robert H. Lurie Children's Hospital of Chicago

Pamela and Britta developed the *Hospital Pharmacy* chapter, including many photographs for their chapters as well as for other chapters in the text.

I would like to thank Brenda Carmichael for designing and preparing the cover and much of the artwork. I'd also like to thank the following contributors who worked on many of the previous editions and whose contributions are still reflected in the current edition: Brenda Vonderau and Peter Vonderau, Cindy B. Johnson and Steve Johnson, and Melanie Duhaine. This includes Ned Richardson and Tamara Newnam who prepared art in previous editions. I'd also like to thank the staff of Morton Publishing (Doug, David, Rayna, Marta, Chrissy, and many others) for all they have contributed over six editions of this text.

Finally, I'd like to thank Alison Reeves, one of the very best textbook editors I know. She expertly guided this text through five editions. Her contributions have been invaluable and will be felt for many editions to come.

Dennis Hogan
Publisher

Reviewers

For this edition, we'd like to especially thank David R. Bright, Ferris State University, who began his involvement with *The Pharmacy Technician* with a detailed review of the text; Ryan Lampien, Renown Regional Medical Center, Reno, NV; Carol Blanton, Spartanburg Community College; and Valerie Stevens, St. Louis College of Pharmacy. We'd also like to thank the many other reviewers who have provided valuable input on recent editions of *The Pharmacy Technician,* in particular: Nicole K. Daw, CPhT, RPT, Lincoln Technical Institute, Fern Park, FL.; Roberta M. Ebbers, CPhT, M.A., National American University, Bloomington, MN; Steven L. Feaver, CPhT, PIMA Medical Institute, Las Vegas, NV; Amber Fowler, CPhT, Pima Medical Institute, Mesa, AZ; Valerie Greene, B.S., St. Louis College of Health; Heather Krehl, B.S., PhTR, CPhT, Milan Institute, Amarillo, TX; Jaimi Paschal, M.S., San Joaquin Valley College; Elizabeth Pearsall, Ph.D., CPhT, Virginia College, Biloxi, MS; Michael Perun, B.S., Lincoln Technical Institute, Allentown, PA; and Lora Plank, M.S.N., R.N., CNOR, CST, CPhT, Ivy Tech Community College, Valparaiso, IN.

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We would also like to thank the following people for helping produce original photography: Kristi L. Bernal, Hanna Bialyjan, Mary Dean, Sohrab Forouhar, Cory Hall, Iris Johnson, Mollie McMullen, Ryan Mignagaray, Dennis Shields, Nina Urbina, Shannon Wetzel, and Panli Zheng.

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The Pharmacy Technician

Seventh Edition

1

PHARMACY & HEALTH CARE

LEARNING OBJECTIVES

At the completion of study, the student will:

- ✔ be familiar with approaches to medicine in times before the 20th century.
- ✔ describe developments in medicine in the past century.
- ✔ know the contributions of historical figures in the practice of modern medicine.
- ✔ have an overall understanding of the pharmacy profession as well as the settings and economic environment in which it operates.
- ✔ have a general understanding of how computers are used in pharmacy.

THINKING THINGS THROUGH

Sarah and 15 of her coworkers were recently laid off from a local tire company where Sarah had worked for 10 years. The company has shifted much of its operations overseas and it is not likely she will be called back to work. The employees who were laid off were given a severance package as well as payment to train for a new career at the local community college. After meeting with a career counselor to help find the type of training she would find most rewarding, Sarah decided she would like to pursue a career in health care, possibly as a pharmacy technician.

As you read this chapter, keep in mind the following questions:

1. What are some reasons for pursuing a career in health care and, in particular, as a pharmacy technician?
2. What are some of the primary environments today for employment as a pharmacy technician?

FROM MEDICINE'S ORIGINS ...

Our knowledge of medicine goes back thousands of years.

Like many ancient peoples, Sumerians living between the Tigris and Euphrates rivers around 4000 B.C. believed that demons were the cause of illness. They studied the stars and the intestines of animals for clues to the supernatural causes of man's condition and fate. In many cultures, physicians were priests and sometimes considered gods or demigods. The Egyptian Imhotep, for example, born around 3000 B.C., was a priest, an adviser to pharaohs, and the first physician known by name. After his death, he was named a demigod and eventually a god: the Egyptian god of medicine.

The supernatural approach to treating illness gradually gave way to a more scientific approach based on observation and experimentation.

Around 400 B.C., the Greek physician Hippocrates developed a more scientific approach, which has guided Western medicine for much of the time since. He promoted the idea of diagnosing illness based on careful observation of the patient's condition, not supernatural or other external elements. He also wrote the oath that physicians recited for centuries and still honor today: the Hippocratic oath to help and not do harm. From Hippocrates and others following in his footsteps, an approach to medicine in which natural causes were examined scientifically gradually grew to become the dominant approach to treating human illness.

panacea a cure-all (from the Greek *panakeia*, same meaning).

pharmacology the study of drugs—their properties, uses, application, and effects (from the Greek *pharmakon*: drug, and *logos*: word or thought).

MEDICAL MYTH

Pandora's Box

As punishment for Prometheus' theft of fire for mankind, the Greek god Zeus created Pandora and had her collect gifts for man from the gods. These gifts were really punishments that included disease and pestilence. They were released upon the world when Pandora opened her box.

The Greek God of Medicine

The ancient Greek Aesculapius was said to have been such an extraordinary physician that he could keep his patients from dying and even raise the dead. This skill angered Pluto, the god of the underworld, because it reduced the number of his subjects. At Pluto's request, Zeus killed Aesculapius with a lightning bolt, then named him the god of medicine. Aesculapius' daughter, ***Panacea***, became the goddess of medicinal herbs.

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Besides looking to the supernatural, several ancient cultures also looked to the natural world for medical remedies, many of which are still used today.

Early man understood that plants and other natural materials had the power to treat or relieve illness. The ancient Sumerians used about 250 natural medicines derived from plants, many of which are still used today. Around 3000 B.C., the Chinese Emperor Shen Nung is said to have begun eating plants and other natural materials to determine which were poisonous and which were beneficial. One of the first known practitioners of trial-and-error drug testing, he is believed to have established 365 herbs that could be used in health treatments, and herbal medicine remains a major component of Chinese medicine today.

In 100 A.D., the Indian physician Charaka wrote the Charaka Samhita, which among other things described over 500 herbal drugs that had been known and used in India for many centuries.

About the same time, Avicenna, who was perhaps the greatest Islamic physician, wrote a five volume encyclopedia, one volume of which was devoted to natural medications and another to compounding drugs from individual medications; his writings dominated medical thinking in Europe for centuries. By 1500, the Indians of Mexico had a well-established *pharmacology* that included more than 1,200 drugs and was clearly the result of many hundreds of years of medical practice. One plant, the sarsaparilla, became very popular in Europe for kidney and bladder ailments and can be found to this day in many medicinal teas.

Western man also has used nature as a source for many of the drugs still in use today.

In 1785, the British physician William Withering published his study of the foxglove plant and the drug it contained, digitalis, which became widely used in treating heart disease. Foxglove had been used since ancient times in various remedies but Withering described a process for creating the drug from the dried leaves of the plant and established a dosage approach. And in 1943 Russell Marker created the hormone progesterone, the first reliable birth control drug, from a species of Mexican yam.

NATURE'S MEDICINE

Nature's Aspirin

The ancient Greek physicians Hippocrates and Dioscorides both wrote about the pain-relieving ability of the bark of a white willow tree that grew in the Mediterranean. In the 1800s, more than 2,000 years after Hippocrates' time, the active ingredient in the willow bark, salicylic acid, was derived by chemists. However, because of difficulties in taking salicylic acid internally, acetylsalicylic acid, popularly known as aspirin, was developed and it eventually became the most widely used drug in the world.

A Treatment for Malaria

Malaria had long been one of the most deadly diseases in world history, until quinine, made from the bark of the Peruvian cinchona tree, was discovered. Popularly called *Jesuit's powder* for the Spanish priests that sent it to Europe from the New World, its use, along with preventive measures aimed at eradicating the cause of malaria, finally brought this deadly disease under control.

An Early Anesthetic

The Indians of the Andes chewed coca leaves for their medicinal effects, which included increased endurance. The active ingredient in the leaves was cocaine, which in 1884 was shown to be the first effective local anesthetic by Carl Koller, a Viennese surgeon. This discovery revolutionized surgery and dentistry, since previously anesthesia was administered on a general basis—that is, to the whole body. Eventually, because of its harmful properties when abused, a man-made substitute was developed, called procaine or Novocain®.

... TO MODERN MEDICINE

Today, while we still use many drugs derived from natural sources, we use more than twice as many *synthetic* drugs.

Synthetic drugs and the ability to mass-produce them often have advantages in cost, effect, and availability over natural drugs.

Some man-made drugs have replaced natural drugs and others are for entirely new uses.

The creation in 1899 of the easier-to-take acetylsalicylic acid, or aspirin, from salicylic acid was one of the first discoveries to prompt more pharmaceutical research and development. Then in Britain in 1928, Alexander Fleming discovered a fungus that produced a chemical that kills bacteria. He named the chemical penicillin and it was the first *antibiotic* drug. Its discovery was followed shortly by World War II in which the ability to mass produce penicillin was critical to Allied success.

This and other war-related drug needs stimulated the U.S. pharmaceutical industry to dramatically boost its capacity and production.

Ever since, pharmaceutical research and development in the United States has grown substantially, making it the world's leading producer of pharmaceuticals.

Due in part to the dramatic growth in pharmaceutical medicine, the average life span in the United States has increased by over 30 years since 1900.

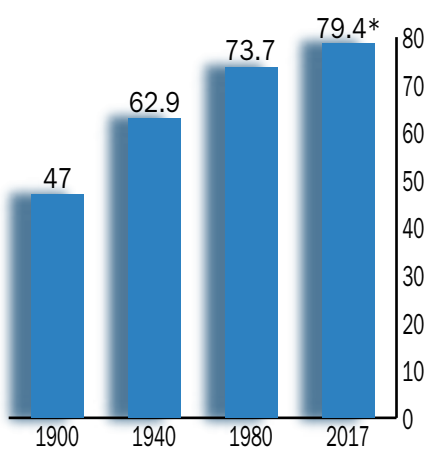
In 1900, the average American lived only into their late 40s. By 2019, the average life expectancy at birth in the United States is estimated to rise to 79.4 years. Similar changes have been seen throughout the industrialized world and to a lesser extent in developing countries. The growth of hospitals, advances in the treatment of disease, improved medical technology, better understanding of nutrition and health, and the rapid increase in the number of effective drugs and vaccines have all contributed to this profound change in improved life experience.

antibiotic a substance that harms or kills microorganisms like bacteria and fungi.

synthetic combining simpler chemicals into more complex compounds, creating a new chemical not found in nature.

The Age of Antibiotics

In World War I, more soldiers died from infections than the wounds themselves. Although penicillin was discovered as an antibiotic in 1928, it was difficult to produce and for years not much was made of the discovery. With the start of World War II, however, British scientists looked again at penicillin and established that it was effective in fighting infections. Already under attack from Germany and unable to develop mass production methods for penicillin, the British sought help in the United States. In 1942, the Pfizer pharmaceutical company was able to develop a method for mass production of the drug, and by D-Day the Allied army was well stocked with it. Its use saved many thousands of lives during the war and revolutionized the pharmaceutical industry. A period of intense research and discovery in the field of antibiotics began, and many new antibiotics were developed that have dramatically contributed to improved health and increased life expectancy.



Source: www.data360.org

average life expectancy in the United States through 2017 (*estimated)

THE DRUG INDUSTRY

Patenting Discoveries

Patenting new discoveries is an important part of the pharmaceutical development process because it protects against illegal copying of the discovery. The company holding the patent is able to control the marketing of the product and use this as a way to recover their original investment. Since patenting generally occurs long before a drug is approved, however, a company usually has only about 10 years of patent protection left in which to market their product without competition from direct copies called generic versions. For more information, see the section on New Drug Approval and Marketed Drugs in Chapter 3.

With the increasing availability of powerful drugs, drug regulation became more important than ever.

Leaders and governments have long sought to regulate the use of medicinal drugs because of their effect on the population's health. The explosive growth of pharmaceuticals made governments throughout the world keenly aware of the importance of setting and maintaining standards for their distribution and use.

In the United States, drug regulation is performed by the Food and Drug Administration.

FDA activity is a major factor in the nation's public health and safety. Before a drug can be marketed, it must be shown through testing that it is safe and effective for its intended use. Once marketed, the FDA monitors drugs to make sure they work as intended, and that there are no serious negative (adverse) effects from their use. If drugs that are marketed are found to have significant adverse effects, the FDA can recall them (take them off the market).

The discovery of new drugs requires a major investment of time, research, and development.

The pharmaceutical industry employs thousands of scientists and devotes about one-sixth of its income to research and development. Bringing a new drug to market is a long and difficult process in which the vast majority of research does not produce a successful drug. Thousands of chemical combinations must be tried in order to find one that might work as hoped. Once a potentially useful drug is created, it must undergo an extensive testing and approval process before it can be made available to the public. In the United States, the length of time from the beginning of development through testing and to ultimate FDA approval is often more than 10 years.

It's in the Genes

One of the most exciting areas of pharmaceutical research is performed by molecular biologists studying human genes. While antibiotics are the answer for many infectious diseases, many other diseases that seem based on heredity are effectively untreatable. The study of the human genome has shown that many diseases are related to genetic defects. This has led to the creation of new drugs that can successfully treat many diseases previously considered untreatable. As a result, the field of biotechnology has become the most dynamic area of pharmaceutical research and development.

MEDICINE THROUGH THE AGES — A TIME LINE —

4000 B.C.

Ancient Sumerians studied the stars and animal intestines to divine man's fate and physical condition.

3000 B.C.

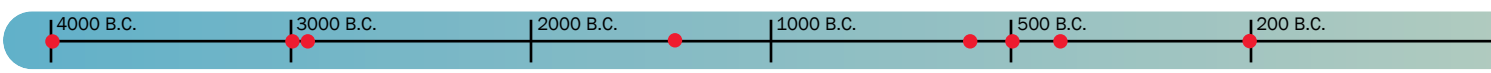
The **Egyptian Imhotep,** born in 3000 B.C., was a priest, adviser to pharaohs, and the first physician known by name. After his death he was eventually named the Egyptian god of medicine.

1500 B.C.

The most complete record of ancient Egyptian medicine and pharmacology, called the **Papyrus Ebers,** dates back to 1500 B.C. This 1,100 page scroll document includes about 800 prescriptions using 700 drugs, mostly derived from plants.

400 B.C.

A number of medical documents were written by different Greek physicians under the name **Hippocrates.** These works avoided the supernatural and religious approaches to medicine and instead were grounded in scientific reasoning based on close observation of the patient. They also contained writings about the conduct of physicians, including the famous Hippocratic oath.



3000 B.C.

The **Chinese Emperor Shen Nung** is said to have begun tasting plants and other natural materials to determine which were poisonous and which were beneficial. One of the first known practitioners of trial and error drug testing, he is credited with establishing hundreds of herbal medicines.

600 B.C.

A cult following **Aesculapius, the Greek god of Medicine**, established centers where medicine was practiced. These early clinics became training grounds for the great Greek physicians of later years.

500 B.C.

The **Greek Alcmaeon,** a student of Pythagorus, saw diseases as a result of a loss of the body's natural equilibrium, rather than the work of the gods.

200 B.C.

The first official Chinese pharmacopeia, the **Shen Nung Pen Tsao**, listing 365 herbs for use in health treatments, is believed to have been published. This can be considered an early Chinese forerunner to the FDA approved drug list.

Zhang Zhongjing was a Chinese physician who wrote the **Shanghan Zabing Lun**, a summary of the medical knowledge of the time that is still referred to in China today.

tip

Since the use of drugs goes so far back in history, many terms in the U.S. are based on Greek or Latin words.

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100 B.C.

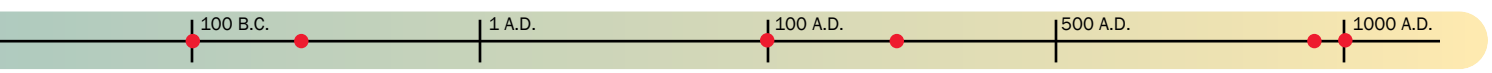
King Mithridates of Pontos practiced an early form of immunization by taking small amounts of poisons so that he could build up his tolerance of them. It is said that he was so successful that when he eventually decided to kill himself through poisoning, he was unable to do so, and had to be killed by someone else. The potion Mithridates developed, Mithridaticum, was believed to be good at promoting health and was used for 1,500 years.

100 A.D.

The **Indian physician Charaka** wrote the **Charaka Samhita**, the first great book of Indian medicine which, among other things, described over 500 herbal drugs that had been known and used in India for many centuries.

900 A.D.

The **Persian Rhazes** wrote one of the most popular textbooks of medicine in the Middle Ages, the **Book of Medicine Dedicated to Mansur**. A man of science, Rhazes was also an alchemist who believed he could turn lesser metal into gold. When he failed to do this, he was ordered to be beaten over the head with his own chemistry book until either his head or the book broke. Apparently, it was a tie. Rhazes lost sight in one eye but lived to continue his work.



77 B.C.

Dioscorides, a Greek physician, wrote the ***De Materia Medica***, five books that described over 600 plants and their healing properties. His work was the main influence for Western ***pharmaceutics*** for over 1,600 years. One of the remedies he described was made from the bark of a type of willow tree, the active ingredient of which was salicylic acid, the natural drug on which acetylsalicylic acid (aspirin) is based. He also described how to get opium from poppies.

162 A.D.

The Greek physician **Galen** went to Rome and became the greatest name in Western medicine since Hippocrates, both through his practice and extensive writings, nearly 100 of which survive. He believed there were four humours in man that needed to be in balance for good health, and he advocated bleeding to assist that balance. He also believed in the vigorous application of a scientific approach to medicine and his emphasis on education, observation, and logic formed the cornerstone for Western medicine.

1000 A.D.

Perhaps the greatest Islamic physician was **Avicenna**. His writings dominated medical thinking in Europe for centuries. He wrote a five volume encyclopedia, one volume of which was devoted to natural medications and another to compounding drugs from individual medications.

materia medica generally pharmacology, but also refers to the drugs in use (from the Latin *materia*, matter; and *medica*, medical).

pharmaceutics of or about drugs; also, a drug product.

MEDICINE THROUGH THE AGES — A TIME LINE (cont'd)

1500 A.D.

In the early 1500s, a Swiss alchemist who went by the name of **Paracelsus** rejected the humoural philosophy of Galen and all previous medical teaching other than Hippocrates. Though he had many critics, he is generally credited with firmly establishing the use of chemistry to create medicinal drugs. Included in his work is the first published recipe for the addictive drug laudanum, which became a popular, though tragically abused, drug for the next 300 years.

1630 A.D.

Jesuits sent **quinine** back to Europe in the early 1600s. Also called Jesuit's powder, it was the first drug to be used successfully in the treatment of malaria.

1785 A.D.

The **British Physician, William Withering**, published his study of the **foxglove** plant and the drug it contained, **digitalis**, which became widely used in treating heart disease. Foxglove had been used since ancient times in various remedies but Withering described a process for creating the drug from the dried leaves of the plant and established a dosage approach.

1500 A.D.

When the Spanish found them, the **Indians of Mexico** had a well established pharmacology that included more than 1,200 drugs and was clearly the result of many hundreds of years of medical practice. One plant, the sarsaparilla, became very popular in Europe for its use on kidney and bladder ailments and can be found to this day in many medicinal teas.

1580 A.D.

In China, **Li Shi Zhen** completed the **Pen Tsao Kang Mu**, a compilation of nearly 2,000 drugs for use in treating illness and other conditions.

1721 A.D.

Dr. Zabdiel Boylston in Boston became the first person to administer a **smallpox vaccine** in what is now the United States. Boylston had already contracted the disease in an earlier epidemic. The first people he inoculated were his six-year-old son and two slaves, all of whom developed only a mild case of smallpox and then recovered. While much of the population was initially extremely suspicious, 249 people were eventually inoculated, six of whom died, compared to 844 deaths among the 5,980 people who contracted the disease naturally.

1796

Edward Jenner successfully developed a vaccine from the cowpox disease to inoculate against smallpox.

1803

The German pharmacist **Frederich Serturner** extracted morphine from opium.

1846

In Boston, the first publicized operation using **general anesthesia** was performed. Ether was the anesthetic.

antitoxin a substance that acts against a toxin in the body; also, a vaccine containing antitoxins, used to fight disease.

hormones chemicals produced by the body that regulate body functions and processes.

human genome the complete set of genetic material contained in a human cell.

1864

Louis Pasteur's experiments showed that microorganisms cause food spoilage, and that heat can be used to kill them and preserve the food. Though others had proposed principles of **germ theory** previously, Pasteur's work was instrumental in it becoming widely accepted.

1884

In 1884 **Carl Koller,** a Viennese surgeon, discovered that cocaine, the active ingredient in coca leaves, was useful as a local anesthetic in eye surgery, and cocaine became established as the **first local anesthetic**.

1928

In Britain, **Alexander Fleming** discovered a fungus that produces a chemical that kills bacteria. He named the chemical **penicillin**. It is the first antibiotic drug.

1943

Russell Marker created the hormone **progesterone**, the first reliable birth control drug, from a species of Mexican yam.

1951

James Watson and **Francis Crick** identified the structure of **DNA**, the basic component within the cell that contains the organism's genetic code.

1987

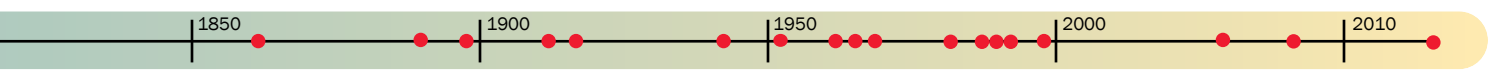
AZT became the first drug approved by the FDA for AIDS treatment.

1988

The **Human Genome Project** was started with the goal of mapping the entire DNA sequence in the ***human genome***. This information will provide a better understanding of hereditary diseases and allow the development of new treatments for them.

1989

Amgen, a **biotechnology** company that develops products based on advances in cellular and molecular biology, introduced its first product, Epogen, an anemia treatment for dialysis patients.



1890

Effective ***antitoxins*** were developed for diphtheria and tetanus, giving a major boost to the development of medicines that fight infectious disease.

1899

Acetylsalicylic acid, popularly known as **aspirin**, was developed because of difficulties in using salicylic acid, a drug contained in certain willow trees that had long been used in the external treatment of various conditions.

1921

In Toronto, Canada, **Frederick Banting** and **Charles Best** showed that an extract of the ***hormone*** **insulin** lowers blood sugar in dogs and so might be useful in treating the terrible disease diabetes. Then biochemist **James B. Collip** developed an extract of insulin pure enough to test on humans. The first human trial, in January 1922, proved successful and dramatically changed the prospects for all diabetics.

1955

Dr. Jonas Salk succeeded in developing a refined **injectable polio vaccine** from killed polio virus. (In 1954 polio had killed more than 13,000 and crippled more than 18,000 Americans.)

1957

Albert Sabin developed an **oral polio vaccine** using a weakened live virus that could be taken orally rather than by injection. However, because of risk of an associated disease from the live virus, only the injectable form of the vaccine was used to inoculate children after January 2000.

1960

The **birth control pill** was introduced.

1981

First documented cases of **AIDS.**

1996

Highly active anti-retroviral therapy (HAART) was introduced to treat AIDS. A combination of one protease inhibitor and usually two antiretroviral drugs, it proves extremely effective in slowing HIV progress, contributing to a 47% decrease in the AIDS death rate in 1997.

1996

Dolly the sheep was the first mammal to be **cloned** from an adult cell, living for almost seven years.

2006

Gardasil was marketed as the first preventative **HPV vaccine** and the first to target a cause of cancer.

2008

Scientists in Japan created an **artificial DNA molecule** using four new artificial bases.

2016

Artificial Intelligence (AI) was used to determine the correct dose of immunosuppressive drugs.

PHARMACY TODAY

Though physicians or other licensed prescribers may sometimes give patients prescription medications, most prescriptions are dispensed to the patient by a pharmacist.

Pharmacists at the more than 60,000 community pharmacies account for approximately half of the distribution of prescription drugs in the United States. The rest reach consumers primarily through hospitals, mass merchandisers, food stores, mail-order pharmacies, clinics, and nursing homes—all of which employ pharmacists for dispensing medications.

The sheer number of available drugs, their different names and costs, the number of prescriptions from different physicians, and the involvement of third-party insurers are among many factors that make using prescription drugs a highly complex area.

As a result, consumers rely on pharmacists to provide information and advice on prescription and over-the-counter medications in easily understood language. They also routinely ask the pharmacist to make recommendations about less expensive generic substitutes for a prescribed drug.

As a result, the pharmacist's role has been expanding to meet the need for greater pharmacist-patient consultation and even direct medication administration services.

In 1990, the U. S. Congress required pharmacists to provide counseling services to Medicaid patients in the Omnibus Budget Reconciliation Act (OBRA). A number of states require this for all patients, and it is generally considered a fundamental service for pharmacists to provide. Since 1990, state laws have gradually changed so that pharmacists can now administer immunizations in all 50 states. In 2003, the Medicare Modernization Act (MMA) expanded the role of the pharmacist to provide Medication Therapy Management (MTM) services to some Medicare patients.

In the past decade, pharmacists have been gaining provider status in some states.

This means that pharmacists can be reimbursed more broadly for the services they provide to the Medicaid population as well as those who are insured by some private sector health insurance plans.

THE PHARMACIST

A Trusted Profession

Pharmacists consistently rank as one of the mostly highly trusted and ethical professions in the United States, according to Gallup Polls. In 2019, the top five professions were:

1. Nurses
2. Medical Doctors
3. Pharmacists
4. High School Teachers
5. Police Officers

Education

To become a pharmacist, an individual must have earned a Doctor of Pharmacy degree from an accredited college of pharmacy (of which there are over 140 in the United States), pass a state licensing exam (in some states), and perform experiential training under a licensed pharmacist. Once licensed, pharmacists must receive continuing education to maintain their license. Pharmacists seeking to teach, do research, or work in hospitals often must have postdoctoral education in the form of residency and fellowship training. Three out of five pharmacists work in community pharmacies; one out of four in hospitals.

PHARMACY SETTINGS

The primary environments for pharmacist and technician employment are:

- **Community pharmacies:** independent and chain retail pharmacies.
- **Hospitals:** in-patient and out-patient pharmacies.
- **Mail order operations:** pharmacy businesses that provide drugs by mail to patients, a fast growing area.
- **Long-term care:** residence facilities that provide care on a long-term rather than acute or short-term basis.
- **Managed care:** care that is managed by an insurer, such as Kaiser Permanente.
- **Home care:** care provided to patients in their home, often by a a home-care agency working with a home-care pharmacy.
- **Compounding pharmacies**: specialized pharmacies that prepare compounded medications.

Medication Therapy Management services provide patients with a comprehensive look at all of the medications they are taking rather than consultation on only the prescriptions dispensed on a given day.

Pharmacists work with the patients to look for ways to improve health outcomes such as better adherence to the drug therapy plan. In some cases, the pharmacist makes recommendations to the physician for changes in drug therapy. In an initial MTM encounter, the pharmacist could spend 30 or more minutes to gain information about the patient's total medication profile as well as other health information. Follow-up MTM encounters take less time. While pharmacists are not paid for routine counseling, they are paid for MTM services at approximately $1 to $3 per minute.

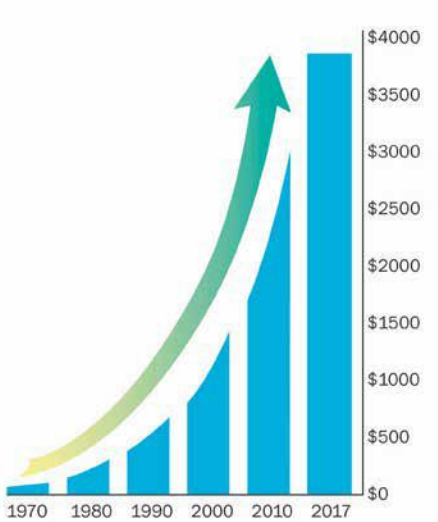
All of these developments have expanded the pharmacist's role in health care.

Even the traditional role of dispensing medications has grown enormously: From 1999 to 2017, the number of prescriptions increased almost 50% (from 2.8 billion to 4.1 billion), and the number of pharmacists increased 60% (from 185,000 to 310,000). To help with both the volume of prescriptions and the increasingly complex environment, pharmacists use powerful computerized tools to manage customer profiles, inventory, pricing, and other key aspects of pharmacy, and pharmacy technicians perform many tasks that pharmacists once performed.

ECONOMIC TRENDS

Between 1970 and 2000, total health-care costs in the United States increased by over 1,500% to $1.3 trillion. By 2017, costs reached $3.9 trillion, roughly 18% of total Gross Domestic Product.

As a result of these escalating costs, there have been increasing efforts by government, industry, and consumers to find ways to control the costs of care. Though drugs represent only a small fraction of overall health-care expenses, they have also been included in these efforts.



$ in billions

Source for illustration and data: U.S. Statistical Abstract

COMPUTERS IN PHARMACY

Pharmacies use computerized management systems to put customer profiles, product, inventory, pricing, and other essential information within easy access.

These systems also automate elements like label printing, inventory management, stock reordering, and billing. As a result, pharmacies and pharmacists dispense more prescriptions and information than ever before.

Pharmacy computer systems may be developed by the user to meet specific needs, be purchased ready-made, or provided by a drug wholesaler.

Wholesalers provide inventory management systems to their customers as part of their service. The wholesaler actually owns the system, which is primarily designed for placing orders with the wholesaler, though it may also contain various other features. Large pharmacy chains have the business volume to justify the expense of developing comprehensive systems that are tailored to their needs. Smaller operations usually buy a commercially available system. Whatever the operation, a computerized pharmacy management system is an indispensable productivity tool.

Although each pharmacy computer system has its own specific features, many general principles of computer usage apply to all systems.

The most important element is stated in the classic computer axiom: garbage in, garbage out. That is, the information produced by the computer is only as good as the information that is entered into it. This means special care has to be taken when entering information (generally called *data*) to make sure it is correct. A simple mistake in data entry can result in the wrong medication being given to the wrong patient or any number of other serious problems.

In addition to traditional computers, pharmacies are increasingly using portable handheld digital devices such as tablets and smartphones.

These portable devices are especially useful for accessing drug information from online references as well as from specific software programs, applications, and apps.

A SAMPLE COMPUTER SYSTEM

Pharmacy computer systems generally offer most or all of these features, and may offer others as well.

Patient Profile

Provides complete information about patients, including prescribers, insurer, medication history, and medical history, including allergies; identifies drug interactions for patients taking multiple medications.

Billing

Checks policies of third parties such as HMOs and insurers; authorizes third-party transactions and credit cards electronically.

Management Reporting

Used for forecasting and financial analysis.

data information that is entered into and stored in a computer system.

Prescriber Profile

Includes state identification numbers and affiliations with facilities and insurers.

Education

Provides information for the patient about drugs, usage, interactions, allergies, etc.

Product Selection

Locates items by various means (brand name, generic name, product code, category, supplier, etc.). Gives updates of prices and other product information.

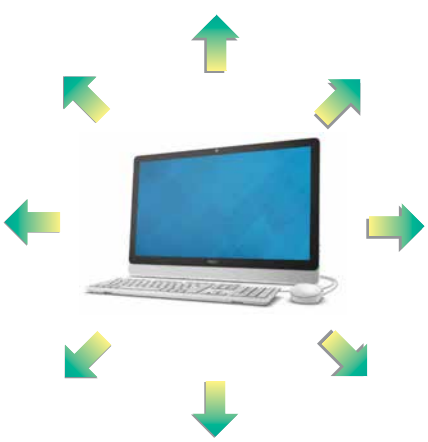


Photo courtesy Dell, Inc.

Inventory

Adjusts inventory as prescriptions are filled; analyzes turnover; produces status reports; automatically reorders based on inventory levels; generates purchase orders.

Pricing

Provides prices for medications and possible substitutes; automatically updates prices; scans prices from bar codes.

Security

Password protection restricts access to authorized users for different features.

Labeling

Creates label, receipt, customer information, and usage instructions.

REVIEW

KEY CONCEPTS

FROM MEDICINE'S ORIGINS ...

- ✔ People have used drugs derived from plants to treat illnesses and other physical conditions for thousands of years.
- ✔ The ancient Greeks used the bark of a white willow tree to relieve pain. The bark contained salicylic acid, the natural forerunner of the active ingredient in aspirin.
- ✔ Cocaine was the first effective local anesthetic.

... TO MODERN MEDICINE

- ✔ The average life span in the United States increased by more than 30 years since 1900.
- ✔ In World War I, more soldiers died from infections than the wounds themselves; in World War II, the mass production of the antibiotic penicillin saved thousands of lives and was seen as a critical factor in the success of the Allied forces.

MEDICINE THROUGH THE AGES—A TIME LINE

- ✔ The foxglove plant contains digitalis, which has been widely used in treating heart disease.
- ✔ Louis Pasteur's experiments showed that microorganisms cause food spoilage and that heat can be used to kill them and preserve the food.
- ✔ Frederick Banting and Charles Best showed that an extract of the hormone insulin lowered blood sugar in dogs and might be useful in the treatment of diabetes.
- ✔ Alexander Fleming discovered the antibiotic chemical penicillin.
- ✔ The Human Genome Project is an attempt to map the entire DNA sequence in the human genome. This information will provide a better understanding of hereditary diseases and how to treat them.

PHARMACY TODAY

- ✔ To become a pharmacist in the United States, an individual must graduate from an accredited college of pharmacy, pass a state licensing exam, and perform an internship working under a licensed pharmacist.
- ✔ Once licensed, pharmacists must receive continuing education to maintain their license.
- ✔ The cost of health care in the United States from 1970 to 2000 rose by over 1,500%.
- ✔ Medication Therapy Management services provide patients with a comprehensive look at all of the medications they are taking rather than consultation on only the prescriptions dispensed on a given day.

COMPUTERS IN PHARMACY

- ✔ Computerized pharmacy management systems put customer profiles, product, inventory, pricing, and other essential information within easy access. One result has been that pharmacies and pharmacists dispense more prescriptions and information than ever before.

SELF TEST

the answer key begins on page 643

Match the Terms

1. antibiotic ____
2. antitoxin ____
3. data ____
4. hormones ____
5. human genome ____
6. materia medica ____
7. panacea ____
8. pharmaceutics ____
9. pharmacology ____
10. synthetic _____

a. combining simpler chemicals into more complex ones, creating a new chemical not found in nature.
b. a cure-all.
c. a substance that acts against a toxin in the body.
d. a substance that harms or kills microorganisms like bacteria and fungi.
e. chemicals produced by the body that regulate body functions and processes.
f. the complete set of genetic material contained in a human cell.
g. the study of drugs.
h. information that is entered into and stored in a computer system.
i. generally pharmacology, but also refers to the drugs in use.
j. of or about drugs; also, a drug product.

Choose the Best Answer

1. The first physician known by name was
   a. Prometheus.
   b. Hippocrates.
   c. Imhotep.
   d. Aesculapius.

2. Hippocrates' approach to medicine was based on
   a. superstition.
   b. careful observation.
   c. astrology.
   d. animal behavior.

3. The ancient Greek goddess of Medicinal Herbs was
   a. Pandora.
   b. Panacea.
   c. Hippocrates.
   d. Euphrates.

4. Aspirin is made from salicylic acid from the bark of the _____ tree.
   a. white willow
   b. cinchona
   c. tea
   d. fig

REVIEW

5. _____ was the first effective local anesthetic.
   a. Quinine
   b. Cocaine
   c. Heroin
   d. Morphine

6. The pharmaceutical manufacturing industry devotes about _____ of its income to research and development.
   a. 1/10
   b. 1/6
   c. 1/3
   d. 1/2

7. _____ protect(s) against illegal copying of new discoveries.
   a. Generics
   b. Brand names
   c. Patenting
   d. The FDA

8. The FDA is required to
   a. ensure that a drug is safe and effective for its intended use.
   b. to monitor a drug after it is marketed to ensure it works as intended.
   c. to monitor a drug for any adverse effects.
   d. all of the above.

9. The length of time from the beginning of development of a new drug to FDA approval is often more than _____ years.
   a. two
   b. five
   c. ten
   d. twenty

10. _____ showed that heat can be used to kill microorganisms associated with food spoilage.
    a. Pasteur
    b. Banting and Best
    c. Watson and Crick
    d. Fleming

11. _____ discovered penicillin could kill some bacteria.
    a. Banting and Best
    b. Watson and Crick
    c. Fleming
    d. Marker

12. The area of greatest employment for pharmacists is
    a. hospitals.
    b. mail order operations.
    c. community pharmacies.
    d. managed care.

13. To become a pharmacist in the United States,
    a. an individual must graduate from an accredited college of pharmacy, pass a state licensing exam, and perform experiential training working under a licensed pharmacist.
    b. an individual must graduate from a nonaccredited college of pharmacy and pass a state licensing exam.
    c. no internship experience is required unless the pharmacist intends to practice in community pharmacy.
    d. an individual must graduate from an accredited college of pharmacy and perform an internship working under a licensed pharmacist. No examination is required.

14. Medicare Modernization Act (MMA) expanded the role of the pharmacist to include
    a. counseling.
    b. MTM services.
    c. home delivery.
    d. dispensing.

15. Pharmacy computer systems generally offer
    a. labeling.
    b. pricing.
    c. prescriber profile.
    d. all of the above.

Critical Thinking Questions

1. Banting and Best first showed insulin lowers blood glucose in dogs. What is the role of animals in new drug discovery and research?
2. The first mammal to be cloned from an adult cell was Dolly the sheep. Why was this controversial?
3. Scientists have created an artificial DNA molecule. How might this be beneficial. Why might this be controversial?
4. Brian is thinking of pursuing a career as a pharmacy technician in a hospital. What are some reasons this career path could be a good choice?
5. Stacy has excellent keyboarding skills. How can these skills be useful when she works as a pharmacy technician?

Researching Information

1. Go to the Merriam-Webster Medical Dictionary at https://www.merriam-webster.com/medical and look up the following terms in the Medical Dictionary (at the bottom of the left-hand column): Hippocratic, digitalis, cocaine, quinine, antibiotic, and insulin, and read about the terms.
2. Go to the MedlinePlus Drug Information website of the National Library of Medicine at www.nlm.nih.gov/medlineplus. Click on "Drugs and Supplements" and then look up the following drugs: quinine, aspirin, and insulin.

REVIEW

Practicing for the Certification Exam

1. Another name for aspirin is
   a. salicylic acid.
   b. acetylsalicylic acid.
   c. acetaminophen.
   d. ibuprofen.

2. Cocaine is
   a. a local anesthetic.
   b. an analgesic.
   c. an antidiabetic.
   d. an antihypertensive.

3. Digitalis is used to treat
   a. indigestion.
   b. diarrhea.
   c. heart disease.
   d. kidney disease.

4. Progesterone is used for
   a. birth control.
   b. heart disease.
   c. kidney disease.
   d. indigestion.

5. Penicillin is
   a. an antibiotic.
   b. an antihypertensive.
   c. an analgesic.
   d. an antidiarrheal.

6. Insulin lowers
   a. blood pressure.
   b. blood sugar.
   c. fevers.
   d. alcohol.

7. Gardasil® is
   a. a vaccine.
   b. an antibiotic.
   c. an antihypertensive.
   d. an analgesic.

8. Another name for procaine is
   a. aspirin.
   b. quinine.
   c. novocain.
   d. progesterone.

9. The law that requires pharmacist to provide counseling services to Medicaid patients is (the)
   a. Medicare Modernization Act.
   b. Omnibus Budget Reconciliation Act.
   c. MTM.
   d. Human Genome Project.

10. MTM services are associated with which law?
    a. Medicare Modernization Act
    b. Omnibus Budget Reconciliation Act
    c. OBRA
    d. Human Genome Project

THINKING THINGS THROUGH WRAP-UP

1. Economic trends show that health care costs escalated in the past half-century, and this trend is continuing. This trend is indicative of job opportunities in health care. The number of available drugs, the number of prescriptions written, and the complex nature of health insurance have led to expanded job opportunities in pharmacy. Federal regulation associated with OBRA and MMA have expanded the role of the pharmacist and also led to an expansion of job opportunities for pharmacy technicians.
2. Community pharmacies account for about half of the prescriptions dispensed and most job opportunities for pharmacy technicians are in the community pharmacy setting. Some other environments include hospitals, mail order operations, long-term care, and compounding pharmacies

2

THE PROFESSIONAL PHARMACY TECHNICIAN

LEARNING OBJECTIVES

At the completion of study, the student will:

- ✔ be familiar with the overall aspects of the pharmacy technician job and the general role of the pharmacy technician in relation to the pharmacist.
- ✔ know what personal standards are expected of the pharmacy technician.
- ✔ know the range of training programs, what agencies establish training and certification regulations, and what organization accredits training programs.
- ✔ know what technicians must do in order to receive and maintain certification.
- ✔ describe the role of job applications, résumés, and interviews in the career of a pharmacy technician.
- ✔ know what kinds of communication are important in pharmacies.
- ✔ understand the role of pharmacy technicians in preventing medication errors.

THINKING THINGS THROUGH

Stacey works in a community pharmacy as a technician and wants to gain the CPhT credential. As you read this chapter, consider the following questions:

1. How can Stacey earn the CPhT credential?
2. What are some similarities and differences between the PTCE and ExCPT?
3. Once certified, how can Stacey maintain certification?

THE PROFESSIONAL PHARMACY TECHNICIAN

In health care, *technicians* are individuals who are given a basic level of training designed to help them perform specific tasks.

This training often is provided at community and technical colleges or even on the job.

To perform their duties, pharmacists today rely upon the assistance of trained support staff called pharmacy technicians.

Technicians perform essential tasks that do not require the pharmacist's skill or expertise. They work under the direct supervision of a licensed pharmacist who is legally responsible for the technician's performance.

Pharmacy technicians perform such tasks as filling prescriptions, packaging doses, performing inventory control, and keeping records.

Having technicians perform these tasks gives the pharmacist more time for activities that require a greater level of expertise, such as counseling patients. As the job of the pharmacist has become more complex, the need for pharmacy technicians has increased. As a result, pharmacy technician is a rapidly growing occupation offering many opportunities. As of 2016, there were about 402,500 pharmacy technicians employed in the United States and it is estimated this number will grow by at least 12% between 2016 and 2026.

Like pharmacists, most pharmacy technicians are employed in community pharmacies and hospitals.

However, they are also employed by or in clinics, home care, long-term care, specialty pharmacies, mail order prescription pharmacies, nuclear pharmacies, Internet pharmacies, pharmaceutical wholesalers, the federal government, and various other settings. Depending upon the specific setting and job, they may perform at different levels of specialization and skill. An introductory level technician job at a pharmacy requires general skills. In various hospital and other environments, there are specialized technician jobs that require more advanced skills developed from additional education, training, and experience. Compensation for these specialized positions is greater than it is for entry level positions.

receiving prescriptions

using computers

inventory control

scope of practice what individuals may and may not do in their jobs.

technician individuals who are given a basic level of training designed to help them perform specific tasks.

taking patient information

filling prescriptions

The Pharmacy Technician's Scope of Practice

The activities on these pages may be part of a pharmacy technician's job responsibilities. However, specific responsibilities and tasks for pharmacy technicians differ by setting and are described in writing by each employer through job descriptions, policy and procedure manuals, and other documents. What individuals may and may not do in their jobs is often referred to as their ***scope of practice***. The pharmacist's scope of practice is, of course, much greater than the technician's. As part of their job requirement, all technicians are required to know specifically what tasks they may and may not perform, as well as which tasks must be performed by the pharmacist.

compounding

ordering

working with a team of health-care professionals

PERSONAL STANDARDS

There are personal standards for pharmacy technicians.

Employers may specify these standards as part of the job requirement. Many, though not all, are outlined on these pages. There are standards for behavior, skill, health, hygiene, and appearance. Anyone seeking to become a pharmacy technician should take a ***personal inventory*** in each of these areas and what they must do to excel in them.

The pharmacy technician is a member of a team, the patient's health-care team.

For this team to succeed, all members, including the technician, must work together for the patient's welfare. If any member of the team fails to perform as required, there can be serious consequences for the patient. Anyone wishing to become a pharmacy technician must be able to work cooperatively with others, communicate effectively, perform as expected, and act responsibly. The patient's welfare depends upon it.

Respect for the Patient

The patient's welfare is the most important consideration in health care. To ensure this, various government laws and professional standards guarantee basic patient rights and require health-care providers to explain these rights to their patients.

The 1996 *Health Insurance Portability and Accountability Act (HIPAA)* made health-care providers responsible for the privacy and security of all identifiable patient health information (also called protected health information, or PHI), in any form, whether it is electronic, on paper, or orally communicated. Among other things, this means that computer files must be protected; any electronic transmission of health information, including claims and billing, must be done via HIPAA–compliant electronic data interchange (EDI); there can be no discussion of patient information within earshot of others; no casual discussion with anyone, including a patient's family members or friends, of a patient or patient information; directing patients to a private area when discussing medications or other personal health issues; making sure files and documents are securely stored where no unauthorized person can access them.

THE TECHNICIAN: A PERSONAL INVENTORY

Technicians should possess the following personal qualities:

✔ **Dependable**

The patient, the pharmacist, and the patient's health-care team will depend upon you performing your job as required, including showing up on time for scheduled work hours. You must do what you are required to do, whether anyone is observing you or not.

✔ **Detail Oriented**

Patients must receive medications exactly as they have been prescribed. Drugs, whether prescription or over the counter, can be dangerous if misused, and mistakes by pharmacy technicians can be life threatening.

✔ **Trustworthy**

You will be entrusted with ***confidential*** patient information, dangerous substances, and perishable products. In addition, many drugs are very expensive and you will be trusted to handle them appropriately.

confidentiality the requirement of health-care providers to keep all patient information private among the patient, the patient's insurer, and the providers directly involved in the patient's care.

personal inventory an assessment of one's characteristics, skills, qualities, etc.

Technicians must follow these personal guidelines:

✔ **Health**

You must maintain good physical and mental health. If you become physically or mentally run-down, you will increase the chance of making serious mistakes.

✔ **Hygiene**

Practice good hygiene. You will interact closely with others. Poor hygiene may hurt your ability to be effective. You will also be expected to perform in infection-free conditions and poor hygiene can violate this requirement.

✔ **Appearance**

Your uniform and personal clothing should be neat, clean, and functional. Shoes should be comfortable. Clothes should allow the freedom of movement necessary to perform your duties. Hair should be well-groomed and pulled back if long. Fingernails should be neat and trim.

Technicians must be capable and competent in the following skill areas:

✔ **Mathematics and Problem Solving**

You will routinely perform mathematical calculations in filling prescriptions and other activities.

✔ **Language and Terminology**

You must learn the specific pharmaceutical terminology and medical abbreviations (e.g., QID, QS) that will be used on your job.

✔ **Computer Skills**

You will regularly use computers for entering patient information, maintaining inventory, filling prescriptions, and so on.

✔ **Interpersonal Skills**

You will interact with patients/customers, your supervisor, coworkers, physicians, and others. You must be able to communicate, cooperate, and work effectively.

tip

There are legal aspects to many of these standards. Failing to follow them can hurt your job performance and result in legal violations.

TRAINING & COMPETENCY

Training and competency requirements for pharmacy technicians differ from setting to setting.

Technician training is generally based on job requirements for the specific workplace, particular skills involved, any applicable professional standards, and state regulations. Specific training and certification requirements are set by each state's board of pharmacy. Regulations vary considerably but almost all states require some form of technician training.

The American Society of Health-System Pharmacists (ASHP), a leading association for pharmacists in hospitals and other health-care systems, publishes a model curriculum for technician training.

This curriculum provides a national standard for developing technician competency. It can be adapted to different settings and training programs. The fifth edition of the *ASHP Model Curriculum* published in 2018 includes 15 standardized categories with corresponding competencies (see Appendix E).

Training programs that meet ASHP standards receive ASHP accreditation.

Accreditation is a peer-review process to determine if a training program meets the standards of the accrediting body. The accreditation process is voluntary but can provide evidence of commitment to quality. The ASHP has been accrediting pharmacy technician training programs in the United States since 1983. Its curriculum is endorsed by the Pharmacy Technician Educator's Council (PTEC).

The ASHP maintains a directory of over 240 schools and training institutions that offer technician training programs.

Most of these have been accredited by the ASHP. They are found in community and technical colleges as well in community pharmacies, hospitals, and other institutions offering on-the-job training.

Your employer will monitor and document your competency.

Your employer is legally responsible for your performance and therefore your competency. In addition to daily monitoring, you will receive regularly scheduled performance reviews. Through these reviews and other means, your employer will document your competency to perform your job.

TRAINING

Photo courtesy Hanson Ng/Design Pics/Getty Images

Depending upon your setting, you will receive training in some or all of the following areas:

- Drug laws
- Terminology
- Prescriptions
- Calculations
- Drug routes and forms
- Drug dosage and activity
- Infection control
- Compounding
- Preparing IV admixtures
- Biopharmaceutics
- Drug classifications
- Inventory management
- Pharmacy literature

An important part of training is exposure to actual workplace settings. Many technicians receive this in the form of on-the-job training from their employer or as internships through community colleges or other training programs.

competent being qualified and capable.

COMPETENCY

Testing

Demonstration of competency during training will generally be through written tests and practical demonstrations. In on-the-job training or internships, your performance will be directly judged by the supervising pharmacist.

Performance

After you have qualified as ***competent***, your employer will continue to monitor and document your performance throughout your employment. Documentation kept in files may include:

- performance reviews,
- complaints,
- and comments by your supervisor and other appropriate personnel.

Most jobs also have a probation period during which time the pharmacy technician is expected to learn certain skill sets. If competency is not met, the technician may receive an extended probation period or be dismissed from the job.

Continuing Education

Pharmacy is a dynamic field that changes constantly. There are always new drugs, treatments, methods, and other developments. As a result, continuing education is a critical element in maintaining competency for pharmacy technicians. In order to perform your job as required, you must continually learn new information. Ultimately, this will make your job more interesting and make you more effective at your job.

tip

For information regarding ASHP accredited programs, contact the American Society of Health-System Pharmacists, 4500 East-West Highway, Suite 900, Bethesda, MD 20814, 866-279-0681 or visit www.ashp.org

State Training Requirements for Pharmacy Technicians

More and more states are requiring technicians to complete a formal training program and/or certification. Furthermore, some states require licensure or registration. Each state has different requirements. Information for the requirements for your state can be found on the website for your board of pharmacy. The National Association of Boards of Pharmacy (NABP) website at www.nabp.net/boards-of-pharmacy provides links to the websites for all state boards of pharmacy in the United States.

CERTIFICATION

Since there is no federal standard for training or competency, obtaining *certification* is a valuable career step for pharmacy technicians.

To receive certification in most states, technicians must pass a standardized national examination, such as the Pharmacy Technician Certification Exam (PTCE) offered by the Pharmacy Technician Certification Board (PTCB), the Exam for the Certification of Pharmacy Technicians (ExCPT) given by the National Healthcareer Association (NHA), or another exam approved by their state board. These exams test the technician's knowledge and competency in basic pharmacy functions and activity areas. While certification is mainly voluntary, as of December 2018 the PTCB had certified over 676,000 pharmacy technicians.

Certification is a mark of achievement that employers, colleagues, and others will recognize.

If you pass a national certification examination, you will become a Certified Pharmacy Technician (CPhT). Beyond verifying your competence as a technician, this designation indicates you have a high level of knowledge and skill and can be given greater responsibilities. This in turn means that you may earn more and will probably cost your employer less time and money in training. Studies have also shown that certified technicians have lower turnover, higher morale, greater productivity, and make fewer errors. Some employers may pay for the cost of a certification exam (if successfully completed) and/or provide training assistance for a certification exam.

Certification must be renewed every two years.

Because pharmacy is a constantly changing field, maintaining skills and competence requires continuing education. In order to renew certification, CPhTs must take 20 contact hours of pharmacy technician-specific continuing education every two years; for PTCB certification renewal, at least one of the continuing education hours must be in patient safety and one hour in pharmacy law.

tip

In accordance with the Americans with Disabilities Act (ADA), special accommodations will be provided for persons with documented disabilities taking a national certification exam.

PTCE & ExCPT

Both PTCE and ExCPT are certified by the National Commission for Certifying Agencies (NCCA). PTCE is additionally certified by the ANSI Personnel Certification Accreditation Program. Candidates must have completed high school or have an equivalent educational diploma, and have no felony convictions. Students can take the PTCE within 60 days of high school graduation, but the certification cannot be received before high school is completed. Both exams are administered in a computerized testing environment.

PTCE

PTCE candidates must have never been convicted of a pharmacy or drug-related misdemeanor. New candidates for PTCB certification are required to complete an ASHP-ACPE accredited education program or have equivalent work experience.

The PTCE exam lasts 2 hours and contains 90 questions, 10 of which are pretest questions.

As of January 1, 2020, the PTCE covers the following four domains:

1. Medications (40%)
2. Federal Requirements (12.5%)
3. Patient Safety and Quality Assurance (26.25%)
4. Order Entry and Processing (21.25%)

To pass, candidates must have a scaled score of at least 1400 out of a possible 1600. Official score reports are available online in 1 to 3 weeks.

certification a legal document certifying that an individual meets certain objective standards, usually provided by a neutral professional organization such as PTCB or NHA.

ExCPT

Candidates may apply for certification if they are at least 18 years old and have either graduated from high school (or expect to within 30 days) or have a GED or other equivalency. They must also have completed a training program within the last 5 years or have had 1200 hours of supervised pharmacy-related work experience within 1 year of the past 3 years.

The ExCPT exam lasts 2 hours and 10 minutes. It contains 120 multiple choice questions, 20 of which are pre-test questions, on the following areas:

- Overview and Laws (25%)
- Drugs and Drug Therapy (15%)
- Dispensing Process (45%)
- Medication Safety and Quality Assurance (15%)

To pass, candidates must have a scaled score of 390 out of a possible 500. Exam results are immediate.

tip

For information regarding the PTCE, contact the Pharmacy Technician Certification Board at 2215 Constitution Avenue, NW, Washington, DC 20037-2985; ph. (202) 888-1699; fax (202) 888-1659; or visit http://ptcb.org

For information regarding ExCPT, contact the Exam for the Certification of Pharmacy Technicians, National Healthcareer Association, 11161 Overbrook Rd., Leawood, KS 66211; ph (800) 499-9092; fax (913) 661-6291; e-mail info@nhanow.com; or visit www.nhanow.com

Continuing Education Requirements

PTCE	ExCPT
➥ **20 Hours Every 2 Years:** 1 hour of pharmacy law; 1 hour of patient safety (refer to Accreditation Council for Pharmacy Education (ACPE) definition of patient safety, defined in the ACPE Policy and Procedures Manual). Subject matter for remaining 18 hours must be pharmacy-technician specific.	➥ **20 Hours Every 2 Years:** 1 hour of pharmacy law; 1 hour of patient safety. Subject matter for remaining 18 hours must be related to pharmacy technician practice
➥ **Qualifying College Courses:** Up to 10 hours may be earned by completing a relevant college course with a grade of "C" or better.	➥ **Qualifying College Courses:** Up to 15 hours may be earned by completing a relevant college course with a grade of "C" or better. ➥ **In-service Projects:** Up to 10 hours may be earned by completing in-service training programs or projects.

SEEKING A CAREER AS A PHARMACY TECHNICIAN

The first step in seeking a job is identifying and meeting the requirements in your state for becoming a pharmacy technician.

Each state's board of pharmacy sets the requirements for obtaining a job as a pharmacy technician in their state. Some states require certification by PTCB or NHA; some states require ***registration*** with or without certification; and a growing number of states require ***licensure***. Requirements for registration vary state-by-state. In some cases, registration consists only of a list of the registered technicians in the state. Licensure requirements typically include having certification by PTCB or NHA. See www.nabp.net/boards-of-pharmacy for links to your state's board of pharmacy.

Having national certification, registration, and/or licensure as required is important for working as a pharmacy technician, but those credentials alone will not get you a job.

Being able to demonstrate you possess the personal standards that are required for a pharmacy technician is critical (see pp. 26–27). Additionally, getting hired often requires you to have some relevant experience. Relevant experience for hospital pharmacy technician positions could include having worked as a pharmacy technician in another practice setting, such as a community pharmacy. Relevant experience for a community pharmacy technician could include retail experience outside of the pharmacy department. Experience in other entry-level positions within the same company can also open advancement opportunities for well-performing employees: Employers often prefer hiring candidates who have a proven track record within their own company.

tip

Conservative, professional dress is recommended for interviews. This includes slacks (or skirt, if appropriate), dress blouse or shirt (with necktie, if appropriate), stockings (if appropriate), and dress shoes (not athletic shoes).

THE APPLICATION PROCESS

Applying for the Job

Applying for the job often requires completing an online application. The goal of the application is to get an invitation to interview for the job. Only the most qualified applicants are typically invited for interviews. It is important to provide complete and accurate information about yourself. Include previous supervisors as references if you had a strong work record with them.

Résumés

In addition to completing online applications, résumés can increase the chances of being invited to interview and eventually land a job. Résumés supply a concise account of a job applicant's education and qualifications, along with information about previous work experience, and professional references. As with the job application, make sure your résumé is factually correct and does not have any typographical errors.

Interviews

Interviews provide employers with a chance to get to know job candidates and provide candidates with a chance to learn more about the employer. Employers generally ask questions to assess how dependable the candidates are and how well they are suited for the job. Always present yourself professionally, both in communication and dress. Prepare for interviews by rehearsing with practice questions.

Criminal Background Checks

Because pharmacy technicians work with dangerous and habit-forming drugs, criminal background checks are generally required. In many cases, the costs for the background checks are paid by the person applying for the job.

MOCK INTERVIEW QUESTIONS

Q. Why do you want to work as a pharmacy technician?

A. I have learned a lot about the career from a friend who is a pharmacy technician. She told me about the challenges she faces and I believe I am well equipped to handle those challenges.

Q. What experience do you have to prepare you for working here as a pharmacy technician?

A. I worked as a sales clerk at the Be Healthy drug store and I already know a lot about the company. I want to progress in my career with this company.

Q. What are your career goals for 5 years from now?

A. I want to become a certified pharmacy technician, learn advanced skills, and eventually seek promotion within the company.

Q. We are looking for a very dependable employee. What are some examples that show that you can be dependable for us?

A. I am very dependable. I am hard working. My past employers will tell you that I have never been absent or even late for work. In fact, I always arrive to work at least 10 minutes before I am scheduled to work. Also, I want you to know that I will work if I am called in to work.

Q. What are your greatest strengths and weaknesses?

A. My greatest strength is that I'm a hard worker. My greatest weakness is that I lack confidence in myself.

Some people working in the pharmacy field, including pharmacy technicians, are content to work in the same position for their entire careers.

Others seek opportunities for personal and economic growth in their careers.

Additional education and training don't automatically lead to raises and promotions, but they can help you qualify for advancement opportunities in the future.

Some advanced roles for pharmacy technicians include: lead pharmacy technician, supervisor pharmacy technician, medication history technician, *medication reconciliation technician*, *discharge pharmacy technician*, *specialty pharmacy technician, pharmacy technician informaticist (see below)*, quality control technician, tech check tech, and inventory control technician. Some pharmacy technicians pursue studies toward the doctor of pharmacy degree so they can become registered pharmacists.

discharge pharmacy technician a technician specializing in pharmacy services that may be offered to patients upon discharge.

licensed technician a technician that has met the state requirements for licensure and been issued a license by the state.

medication reconciliation technician a technician that identifies the most accurate list of all the medications patients are taking.

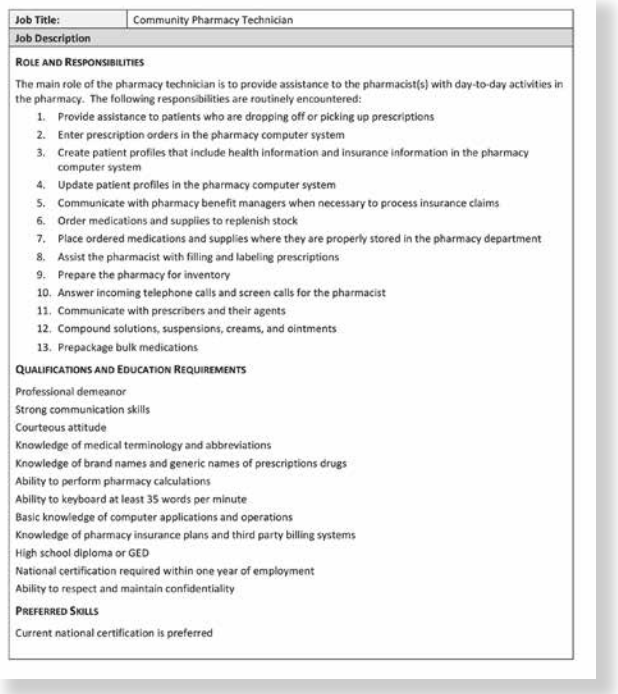
pharmacy technician informatacist a technician that uses technology tools to support the pharmacy information management.

registered technician a technician that has been registered by the state.

specialty pharmacy technician a technician that works in a pharmacy that focuses on specialty pharmaceuticals for patients with certain conditions and diseases like multiple sclerosis, HIV/AIDS, and rheumatoid arthritis.

SEEKING A CAREER (cont'd)

SAMPLE JOB DESCRIPTIONS



Job Title:	Community Pharmacy Technician

Job Description

ROLE AND RESPONSIBILITIES

The main role of the pharmacy technician is to provide assistance to the pharmacist(s) with day-to-day activities in the pharmacy. The following responsibilities are routinely encountered:

1. Provide assistance to patients who are dropping off or picking up prescriptions
2. Enter prescription orders in the pharmacy computer system
3. Create patient profiles that include health information and insurance information in the pharmacy computer system
4. Update patient profiles in the pharmacy computer system
5. Communicate with pharmacy benefit managers when necessary to process insurance claims
6. Order medications and supplies to replenish stock
7. Place ordered medications and supplies where they are properly stored in the pharmacy department
8. Assist the pharmacist with filling and labeling prescriptions
9. Prepare the pharmacy for inventory
10. Answer incoming telephone calls and screen calls for the pharmacist
11. Communicate with prescribers and their agents
12. Compound solutions, suspensions, creams, and ointments
13. Prepackage bulk medications

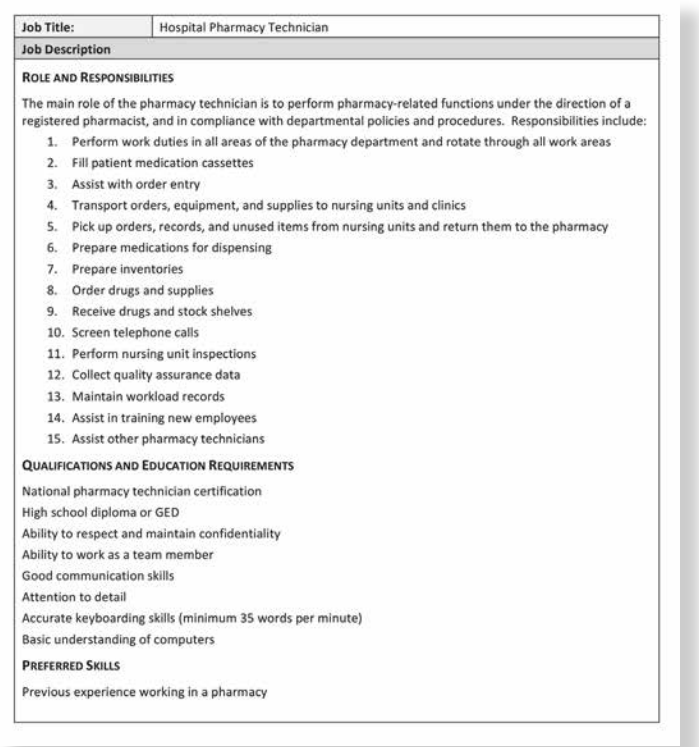
QUALIFICATIONS AND EDUCATION REQUIREMENTS

Professional demeanor
Strong communication skills
Courteous attitude
Knowledge of medical terminology and abbreviations
Knowledge of brand names and generic names of prescriptions drugs
Ability to perform pharmacy calculations
Ability to keyboard at least 35 words per minute
Basic knowledge of computer applications and operations
Knowledge of pharmacy insurance plans and third party billing systems
High school diploma or GED
National certification required within one year of employment
Ability to respect and maintain confidentiality

PREFERRED SKILLS

Current national certification is preferred

Sample Pharmacy Technician Job Description for Community Pharmacy



Job Title:	Hospital Pharmacy Technician

Job Description

ROLE AND RESPONSIBILITIES

The main role of the pharmacy technician is to perform pharmacy-related functions under the direction of a registered pharmacist, and in compliance with departmental policies and procedures. Responsibilities include:

1. Perform work duties in all areas of the pharmacy department and rotate through all work areas
2. Fill patient medication cassettes
3. Assist with order entry
4. Transport orders, equipment, and supplies to nursing units and clinics
5. Pick up orders, records, and unused items from nursing units and return them to the pharmacy
6. Prepare medications for dispensing
7. Prepare inventories
8. Order drugs and supplies
9. Receive drugs and stock shelves
10. Screen telephone calls
11. Perform nursing unit inspections
12. Collect quality assurance data
13. Maintain workload records
14. Assist in training new employees
15. Assist other pharmacy technicians

QUALIFICATIONS AND EDUCATION REQUIREMENTS

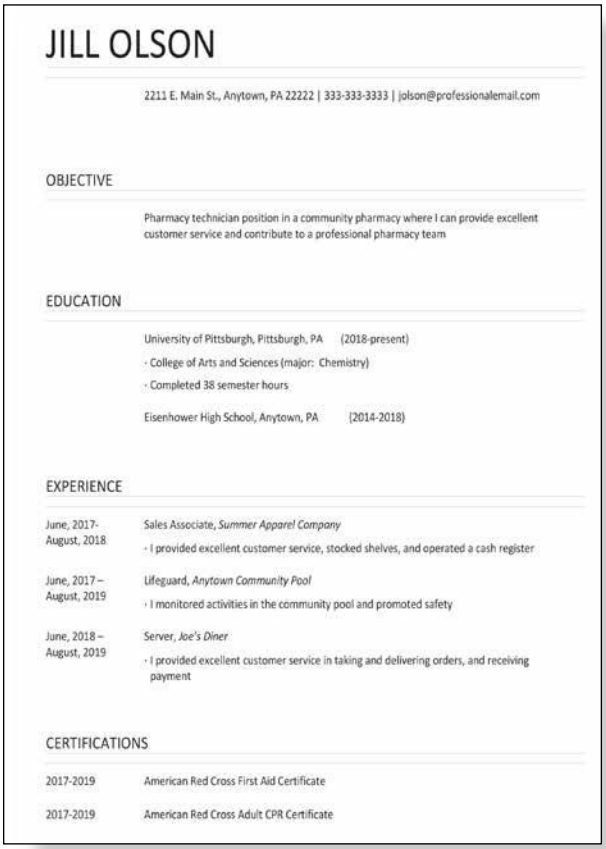
National pharmacy technician certification
High school diploma or GED
Ability to respect and maintain confidentiality
Ability to work as a team member
Good communication skills
Attention to detail
Accurate keyboarding skills (minimum 35 words per minute)
Basic understanding of computers

PREFERRED SKILLS

Previous experience working in a pharmacy

Sample Pharmacy Technician Job Description for Hospital Pharmacy

SAMPLE RÉSUMÉS



JILL OLSON

2211 E. Main St., Anytown, PA 22222 | 333-333-3333 | jolson@professionalemail.com

OBJECTIVE

Pharmacy technician position in a community pharmacy where I can provide excellent customer service and contribute to a professional pharmacy team

EDUCATION

University of Pittsburgh, Pittsburgh, PA (2018-present)
- College of Arts and Sciences (major: Chemistry)
- Completed 38 semester hours

Eisenhower High School, Anytown, PA (2014-2018)

EXPERIENCE

June, 2017-August, 2018 — Sales Associate, *Summer Apparel Company*
- I provided excellent customer service, stocked shelves, and operated a cash register

June, 2017 – August, 2019 — Lifeguard, *Anytown Community Pool*
- I monitored activities in the community pool and promoted safety

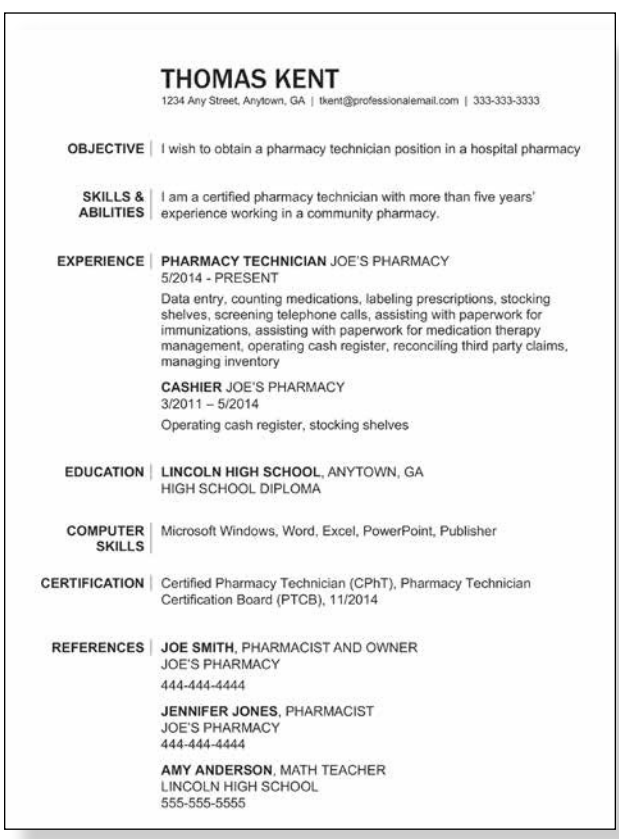
June, 2018 – August, 2019 — Server, *Joe's Diner*
- I provided excellent customer service in taking and delivering orders, and receiving payment

CERTIFICATIONS

2017-2019 American Red Cross First Aid Certificate

2017-2019 American Red Cross Adult CPR Certificate

Sample Résumé for a Pharmacy Technician Position in a Community Pharmacy



THOMAS KENT

1234 Any Street, Anytown, GA | tkent@professionalemail.com | 333-333-3333

OBJECTIVE | I wish to obtain a pharmacy technician position in a hospital pharmacy

SKILLS & ABILITIES | I am a certified pharmacy technician with more than five years' experience working in a community pharmacy.

EXPERIENCE | **PHARMACY TECHNICIAN** JOE'S PHARMACY
5/2014 - PRESENT
Data entry, counting medications, labeling prescriptions, stocking shelves, screening telephone calls, assisting with paperwork for immunizations, assisting with paperwork for medication therapy management, operating cash register, reconciling third party claims, managing inventory

CASHIER JOE'S PHARMACY
3/2011 – 5/2014
Operating cash register, stocking shelves

EDUCATION | **LINCOLN HIGH SCHOOL**, ANYTOWN, GA
HIGH SCHOOL DIPLOMA

COMPUTER SKILLS | Microsoft Windows, Word, Excel, PowerPoint, Publisher

CERTIFICATION | Certified Pharmacy Technician (CPhT), Pharmacy Technician Certification Board (PTCB), 11/2014

REFERENCES | **JOE SMITH**, PHARMACIST AND OWNER
JOE'S PHARMACY
444-444-4444

JENNIFER JONES, PHARMACIST
JOE'S PHARMACY
444-444-4444

AMY ANDERSON, MATH TEACHER
LINCOLN HIGH SCHOOL
555-555-5555

Sample Résumé for a Pharmacy Technician Position in a Hospital Pharmacy

COMMUNICATION

Good communication is essential to teamwork.

It can be thought of as the process of exchanging information. When communication is lacking in the workplace, confusion and frustration can result and lead to other problems, such as misunderstandings or even medication errors. Taking the time to communicate relevant information in the pharmacy is important. Having effective communication channels in pharmacies is needed for optimal pharmacy operations.

Communication can take place in written, verbal, or nonverbal forms.

Written communications consist of formal letters, memos, e-mails, or other documents. Written communications can also be less formal, such as profile notes, sticky notes, or other handwritten notes attached to a prescription. Verbal communication can take place face-to-face, by telephone, or other electronic means. Nonverbal communication can be conveyed by body language or tone. Negative body language can distract from the intended message, while positive body language can enhance it.

Because pharmacy technicians interface with a variety of people, having strong communication skills is an asset.

As you think about your role in the pharmacy and your responsibilities, be vigilant in conducting yourself in a professional manner. A good bit of advice is to always try to use a pleasant and professional tone in your communications, including written, verbal, and nonverbal communications.

Demonstrate cultural competence.

The population demographics of the United States are constantly changing, and it is becoming more and more important for pharmacy technicians to be able to communicate effectively with patients from diverse backgrounds. Cultural competence is a term that describes individuals who are able to provide care to patients of diverse backgrounds.

tip

Always try to use a pleasant and professional tone in all of your workplace communications.

EXAMPLES OF CULTURAL FACTORS

General health behaviors and beliefs:

- In some cultures, men and women take different roles in providing care for the family. In some cultures, the entire family can be engaged in decision making regarding significant health-care matters. In some cultures, patients are less likely to seek preventative services.

Use of complementary and alternative medicine:

- In some cultures, patients are more likely to prefer natural and traditional healing methods over traditional Western medicine. Examples of complementary and alternative medicine include the use of herbs and foods; vitamins and dietary supplements; mind-body interventions such as meditation and energy therapy; and manipulative, body-based methods.

Communication skills:

- Patients or caregivers sometimes present with variations in their abilities to communicate. Some examples are: limited English language proficiency; inability to read or write; low literacy; and low health literacy.