# CHAPTER 2

# DRUG REGULATIONS

## Learning Outcomes:

1. Explain the role of patent medicines in the history of pharmacology and the legislation of drugs.

    Suggested Classroom Activity: Discuss with students how patent medicines have "survived" over a long period of time. Use examples given in the textbook such as Smith Cough Drops, Fletcher's Castoria, Doan's Pills, Vick's Vapo Rub, and Phillip's Milk of Magnesia. Why are these products still popular and widely used? What could be some of the reasons that they survived regulations?

    Suggested Clinical Activity: Have students discuss the use of patent medicines in the hospital setting. Is an order necessary? If so, why?

2. Outline the key U.S. drug regulations and explain how each has contributed to the safety and effectiveness of medications.

    Suggested Classroom Activity: Using the time line in Table 2.1, have students add any future regulations they believe are needed or forthcoming.

    Suggested Clinical Activity: Have students teach assigned patients in the clinical setting what U.S. regulations ensure the safety and effectiveness of their drug therapy.

3. Describe how the *United States Pharmacopeia-National Formulary* (USP-NF) controls drug purity and standards.

    Suggested Classroom Activity: Have students explore the USP website (www.usp.org). Have them look at what type of information is available such as reference standards, health care quality and information, seminars, workshops, and drug safety reviews. Discuss how they could use this information in clinical practice.

    Suggested Clinical Activity: Have students ask a pharmacist how USP-NF information is accessed in their organization.

4. Evaluate the role of the U.S. Food and Drug Administration in the drug approval process.

    Suggested Classroom Activity: Have students log onto the FDA website. Then, have them explore the consumer links and resources. Assign a different link or resource to each student; have each student give a brief summary about whether they thought their source would be helpful to the general patient population.

    Have students choose an FDA industry link to explore. Break students into groups and assign one of the following to each group: CDER, CBER, CFSAN, MedWatch, Health Care Professional, Food Nutrition Industry, and Cosmetic Industry. Have students report back to the group what information is available.

    Suggested Clinical Activity: Have students explain to their assigned patients how the FDA oversees drug products in the United States. If Internet access is available, the student can demonstrate the consumer links on the FDA website.

5. Categorize the four stages of new drug approval.

Suggested Classroom Activity: Break the students into groups and give each group one of the three phases of the clinical drug trial. Have them develop a patient teaching tool to provide teaching to the patient involved in that phase of the trial. How would they explain safety, adverse effects, and patient variables?

Suggested Clinical Activity: If possible in your clinical setting, have students interview either a health care professional or patient involved in a clinical drug trial. They should ask questions about stages and phases of the trial, preclinical investigation, goal of the trial, possible adverse effects, and patient consents and compensations. Have them report back to their clinical group what they learned in their interview. Did it change their thoughts about clinical drug trials? Why or why not?

6. Explain the role of a placebo in new drug testing.

Suggested Classroom Activity: Build off the activity for Learning Outcome 5 and continue to discuss clinical drug trials. Why do some patients receive a placebo? Is there a risk with placebos? How would the patient feel about getting the placebo if the drug turned out to be very effective? Discuss the moral issues regarding controlled drug trials.

Suggested Clinical Activity: If possible in your clinical setting, have students discuss the use of a clinical trial placebo with a nurse or pharmacist. Has either professional experienced concern that a patient was not responding to treatment and might be receiving a placebo? If so, how did the professional cope with this concern?

7. Discuss how recent changes to the approval process have increased the speed at which new drugs reach consumers.

Suggested Classroom Activity: Discuss with the class which disease states could require priority drug approval. Make a list on the classroom blackboard. Then ask the students to prioritize their list. Discuss how difficult it is to decide which disease is “more important.” Discuss if the list would be different in another part of the country or world.

Suggested Clinical Activity: Have students interview a nurse about using newly released drugs. What special concerns does the nurse have and are any special interventions used?

8. Compare and contrast prescription and over-the-counter drugs.

Suggested Classroom Activity: Discuss some of the recent drugs that have been reclassified from prescription to over the counter, such as loratadine (Claritin), cetirizine (Zyrtec), Omeprazole (Prilosec), famotidine (Pepcid), naproxen sodium (Aleve), and cromolyn sodium nasal spray (NasalCrom). Discuss the potential for use and misuse by the consumer. Why are these drugs safer than other drugs in the same category that are still prescription drugs? Does their classification help or harm the consumer?

Suggested Clinical Activity: Assign the students to a patient who is prescribed a drug that is available over the counter. Have students develop a patient teaching plan that will teach the patient how to use the drug safely and how to follow the guidelines.

9. Explain how scheduled drugs are classified and regulated.

Suggested Classroom Activity: Refer to the U. S Drug Enforcement Administration (DEA) website for information about the Controlled Substances Act. Suggested Classroom Activity: Refer to the DEA website for a list of controlled substances.

Suggested Clinical Activity: Have students shadow a nurse or pharmacist who prepares controlled substance medications. Have the student note the regulations in that clinical setting for recording and dispensing the drugs. Have students report if they think the regulations are appropriate or not. What would they change, if anything?

Suggested Clinical Activity: Have students list controlled substance medications they have seen administered in their clinical site. Have the student pick one drug and investigate its use and safety.

10. Discuss the requirements and regulations needed for nurses to have the ability to prescribe drugs.

Suggested Classroom Activity: Have students discuss the requirements for prescriptive powers in your state. What education is required? Is continuing education required? How many nurses in your state have prescriptive powers?

Suggested Clinical Activity: Have students interview a CRNA or other hospital nurse who has prescriptive powers. Discuss which drugs they may prescribe and other laws regulating their ability to prescribe.

**Key Concepts**

1. In the United States laws govern all aspects of drug approval, labeling, manufacturing, marketing, and distribution.
2. Consumers expect that the drug they are taking is safe and effective and that the label is clear and accurate.
3. It is only since the 20th century that standards and regulations have existed to protect the consumer.
4. In early America, patent medicine was widely used and available.
5. There were no laws to regulate these medicines and products could make any claim to health or cure.
6. Many patent medicines contain addictive and at times dangerous additives, such as morphine and cocaine. Such addictive additives guaranteed repeat sales.
7. Several early patent medicines have gone through drug regulation and change and are still available today.
8. The first national drug safety law was the Drug Importation Act, passed in 1848, which

was spurred by the deaths of children in 1901 who were given a contaminated antitoxin.

9. The Biologics Control Act was passed in 1902 to regulate sera, antitoxins, and blood-related products.
10. The Pure Food and Drug Act (PFDA), passed in 1906, required accuracy in drug labeling. In 1912 the Sherley Amendment to the PFDA addressed false therapeutic claims on drug labels, but did not address the issue of proving that the drug company knew that its false claim was intentional.
11. The Harrison Narcotic Act of 1914 required prescriptions for higher doses of narcotic drugs.
12. After deaths in 1937 due to a contaminated drug, the Food, Drug, and Cosmetic Act (FDCA) was passed by Congress in 1938. This act required that drugs be tested for safety before marketing and that drug labels contain instructions for use, but did not define what was considered a prescription drug.
13. In 1951 the Durham-Humphrey Amendment to the FDCA defined the difference between prescription drugs and over-the-counter (OTC) drugs.
14. The Kefauver-Harris Amendment to the FDCA was passed in 1962 requiring that manufacturers prove their drugs safe and effective by conduction of adequate and controlled studies. This amendment also required adverse effects be reported to the FDA and included in literature given to health care providers. It also required informed consent of those patients participating in drug research.
15. In 1966, the FDA began evaluating the effectiveness of previously approved drugs and in 1972 began reviewing OTC drugs for safety and effectiveness.
16. In 1983, the Orphan Drug Act became law to assist with development of drugs for serious, but rare, diseases.
17. The 1997 passage of the Food and Drug Administration Modernization Act required review of medical devices and health claims for food and the Dietary Supplement Health and Education Act of 1994 aimed to control claims of dietary supplements.
18. The Medicare Prescription Drug Improvement and Modernization Act of 2003 aimed to assist patients with prescription drug costs.
19. When drugs were prepared from plants, purity and strength varied due to the ingredients and preparer.
20. Pharmacists began using formularies to list products and recipes and in 1820 the U.S. Pharmacopeia (USP) was established.
21. For over 100 years, the USP and the National Formulary (NF) maintained drug standards in the United States by setting standards for drug purity and strength.
22. The USP covered drug products and the NF covered nondrug ingredients.
23. In 1975 they were merged into the USP-NF, which is published annually.
24. The Food and Drug Administration (FDA), started in 1906, is responsible for ensuring the safety of drugs and medical devices.

25. The Center for Drug Evaluation and Research (CDER) covers drug safety.

26. The Center for Biologics Evaluation and Research (CBER) regulates biologic safety.

27. The Center for Food Safety and Applied Nutrition (CFSAN) oversees herbal products, dietary supplements, and cosmetics, but does not require testing of herbals and dietary supplements before marketing.

28. The drug approval process in the United States was established by the FDA and ensures drugs sold in the United States are safe and effective. The process consists of four stages.

29. The first stage is preclinical research, which involves extensive laboratory testing by the pharmaceutical company. The FDA does not regulate the preclinical investigation.

30. If the preclinical investigation is positive, the company may submit an Investigational New Drug (IND) application to the FDA. Once approved by the FDA, the drug can start clinical phase trials.

31. Phase 1 involves testing on 20 to 80 healthy volunteers.

32. Phase 2 involves testing several hundred patients with the particular disease for the drug. This phase generally includes use of a placebo or inert substance that serves as a control or nontreatment group.

33. Phase 3 involves a large number of patients with the disease for patient variability.

34. If the clinical phase trials are positive, the company will submit a New Drug Application (NDA) to the FDA. If approved, the drug can begin postmarketing surveillance, which is stage 4.

35. Stage 4 looks for harmful drug effects in a large population and helps the FDA discover any serious problems. The Adverse Event Reporting System and FDA public meetings allow patients and health care providers to report problems.

36. Although more diverse populations are used to test drugs, most drugs are not tested in children and pregnant women.

37. Off-label use is when a drug is discovered to be useful for an indication that was not approved by the FDA. The FDA does not regulate off-label use. About 20% of prescriptions are for indications not approved by the FDA.

38. The process of developing and testing a new drug can take many years and the FDA review process can take several years.

39. Some studies estimate the cost of bringing a new drug to market at up to $1.8 billion and pharmaceutical companies are anxious to recoup the high expenses.

40. The public is also anxious for new medications, especially for diseases with a high mortality rate.

41. In 1992 the PDUFA was passed, which provided for yearly product user fees. This income allowed the FDA to restructure and hire more employees, cutting the time required for the

review process in half.

42. Priority drugs—those for serious and life-threatening conditions—now receive accelerated approval.

43. Prescription drugs are considered to be potentially addictive or too harmful for self-administration. Prescription drugs may require skill to administer correctly.

44. Requiring a prescription for drugs allows the patient to be examined and diagnosed and allows for patient teaching and disease monitoring.

45. OTC drugs do not require a prescription from a health care provider.

46. OTC drugs are safe if the patient carefully follows the instructions and are easier to obtain than prescription drugs. Choosing the correct OTC drug can be a problem for the patient, because patients may not be aware of food, drug, and herbal interactions with OTC drugs; hence, self-treatment with OTC drugs can be ineffective.

47. Prescription drugs can undergo a review process by the FDA, which can reclassify a prescription drug to be an OTC drug. In order for a prescription drug to be reclassified as an OTC drug, a high margin of safety must exist.

48. Herbal and dietary supplements are not considered drugs and are available over the counter. They are not subjected to the same regulatory process as prescription drugs.

49. The FDA does not test herbal and dietary supplements for safety. These products can cause side effects and interact with medications.

50. Some drugs have a high potential for dependence and/or are frequently abused, so the sale and distribution of these drugs are highly restricted.

51. These drugs are placed into one of five categories called schedules.

52. The Comprehensive Drug Abuse Prevention and Control Act of 1970 restricts these controlled substances.

53. The Drug Enforcement Administration (DEA) requires hospitals and pharmacies to use registration numbers to purchase these drugs.

54. Complete records must be maintained of qualities purchased and sold.

55. Drugs with the highest abuse potential have additional restrictions, which may include special order forms, no telephone orders, and no refills. There are strict penalties for not following the laws.

56. Historically, prescribing drugs was the responsibility of the physician or dentist.

57. Advanced practice registered nurses (APRNs) are those who have completed graduate-level education that includes advanced pharmacology content and certification by exams.

58. Each state has different requirements for prescriptive authority for APRNs.

59. Work on a consensus model to define APRN practice and education requirements is continuing between a task force of APRNs and members of the National Council of State Boards of Nursing.

60. It is thought that passage of the Patient Protection and Affordable Care Act (ACA) in 2010

will increase the need for practitioners to provide the best and most cost-effective care possible.

# DECISION-MAKING CASE SUMMARIES

## PHARMACOLOGY #6: ASTHMA

| CASE NAME | OVERVIEW | MAJOR CASE DECISIONS |
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| Mr. Brandon Walsh | Mr. Walsh is a 43 year old male presenting with severe dyspnea plus headache, sore throat, and palpitations. He can barely breathe or talk. He was diagnosed with exercise-induced asthma at the age of 16, which has been controlled with albuterol until he had viral pneumonia 4 months ago. He now has dyspnea even at rest. | 1. Prioritizing which presenting symptoms to address first<br>2. Selecting appropriate diagnostic tests to administer to monitor medication effectiveness<br>3. Selecting client teaching topics related to medication administration and medication side effects<br>4. Prioritizing actions when treatment is unsuccessful<br>5. Recognizing incorrect dosing instructions<br>6. Selecting an appropriate IV insertion site |

**Estimated Case Length:** 15 minutes
**Difficulty Level:** Hard

**Learning Objectives:**

- Prioritize nursing care for clients in need of pharmacological intervention for complications related to asthma.
- Identify contraindications for medication therapies given to clients with asthma.
- Administer medications to clients experiencing complications related to asthma.
- Monitor clients with asthma for side effects related to medication administration and drug interactions.
- Advocate for effective care of clients with asthma.
- Provide client teaching about medications to clients with asthma.

| Questions | Correct Answers |
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| 1. Which of Mr. Walsh's symptoms is most important to address first? | *Dyspnea* |
| 2. What important question(s) should you ask Mr. Walsh about his albuterol use before you administer additional medications? **Select all that apply.** | *How long have you been taking albuterol?*;<br>*When was the last time you took a dose of albuterol;*<br>*How many puffs of albuterol do you take daily on average?* |

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| 3. To address the client's dyspnea, the provider has ordered 500 mcg (1 vial of 0.02% solution) ipratropium (Atrovent) via nebulizer. Based on provider orders, which tests will you need to administer to monitor drug effectiveness? **Select all that apply.** | *FEV1 (Forced Expiratory Volume, 1 sec); FVC (Forced Vital Capacity); PEF (Peak Expiratory Flow)* |
| 4. What drug class is ipratropium, and what is its mechanism of action? | *Anticholinergic drug that causes bronchodilation of airway smooth muscles.* |
| 5. Why would the provider have chosen to prescribe an anticholinergic drug for Mr. Walsh rather than a short-acting beta adrenergic agonist? | *Mr. Walsh was already taking a short-acting beta adrenergic agonist without success.* |
| 6. You are now preparing to administer ipratropium via mouthpiece. What client teaching is important for you to provide? **Select all that apply.** | *During drug administration, keep lips sealed around mouthpiece;*<br>*Breathe deeply and slowly through your mouth;*<br>*Rinse your mouth after the treatment is complete* |
| 7. Now that Mr. Walsh is on his nebulizer treatment, you would like to evaluate his other symptoms. What is one potential cause of Mr. Walsh's complaints of headache, sore throat, and palpitations? | *Albuterol overdose* |
| 8. After 15 minutes of treatment with the nebulizer, you re-assess Mr. Walsh's vital signs as well as his lung functions tests, which have the following results:<br>FEV1: 2.0 L (predicted 4.1 L; 48.8%)<br>FVC: 3.9 L (predicted 5.2 L; 75.0%)<br>PEF: 238 L/min (predicted 643 L/min; 37.0%)<br>FEV1/FVC: 51.3%<br>SpO2: 86%<br>What steps should you take next? **Select all that apply.** | *Increase oxygen flow to 6L/min;*<br>*Consult with the provider about other medications to administer* |
| 9. You decide to increase Mr. Walsh's oxygen flow to 6 L/min and consult his provider about additional medications to administer. When you discuss Mr. Walsh's condition with the provider, what | *Cortiscosteroid* |

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| drug class would you anticipate him ordering? | |
| 10. The provider has ordered you to administer methylprednisolone (Solu-Medrol) via IV injection. Which dosing instructions would prompt you to double check the instructions with the provider? | *Administer 0.5 g methylprednisolone in 2 mL isotonic saline solution by IV injection* |
| 11. You confirm with the provider that you should immediately administer 125 mg methylprednisolone in 2 mL isotonic saline solution. You are preparing to insert the IV for the injection. Which is the best choice for the IV for Mr. Walsh? | *Place a 22-gauge needle in the cephalic vein of his non-dominant arm* |
| 12. Thirty minutes after methylprednisolone administration, you again check Mr. Walsh's pulmonary function tests. The results are:<br><br>FEV1: 2.9 L (predicted 4.1 L; 70.7%)<br>FVC: 4.5 L (predicted 5.2 L; 86.5%)<br>PEF: 427 L/min (predicted 643 L/min; 66.4%)<br>FEV1/FVC: 64.4%<br>SpO2: 92%<br>Although Mr. Walsh still has reduced pulmonary function, his breathing is less labored. The provider plans to admit Mr. Walsh for observation and continued medication administration. He also plans to add salmeterol + fluticasone (Advair Diskus 250/50) to Mr. Walsh's maintenance drug regimen at a dose of 1 puff twice daily.<br>What risk diagnosis is appropriate for Mr. Walsh based on his new medication regimen? | *Risk for Infection* |
| 13. What client teaching will you provide Mr. Walsh about salmeterol + fluticasone? **Select all that apply.** | *Salmterol + fluticasone may mask the symptoms of any infection.;*<br>*Salmeterol + fluticasone should not be used as a rescue inhaler.* |