Tools to Help Prevent Medication Errors

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The New York State Education Department has approved Pharmacy Education Unlimited as a sponsor of continuing education courses for pharmacists.

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Learning Objectives

1) Discuss the process of root cause analysis (RCA)
2) Discuss failure mode and effects analysis (FMEA) and its application
3) Describe medication error reduction and prevention procedures
4) Describe ways to improve patient medication safety
5) Examine different strategies to aid in the reduction of medication errors
6) Discuss common errors made by pharmacists and how to prevent them

Introduction

Medications errors, both in hospitals and in community settings, continue to be a concern to health care practitioners and patients. The gigantic scope of the problem was first brought to the public’s attention by the Institute of Medicine’s (IOM) report “To Err is Human-Building a Better Health System”.¹ This report estimated that between 44,000 and 98,000 Americans die of medical errors each year in hospitals and as many as 40% of these could have been prevented. This results in an estimated $17 to $29 billion in lost wages, disability payments, additional medical care and other costs. A follow-up report by the IOM called Preventing Medication Errors found that medication errors harm 1.5 million people per year.² In addition, 400,000 preventable adverse drug events occur per year in hospitals, which equates to about one medication error per patient per day.² A study by Rupp et al. estimated that the rate of medication errors found by community pharmacists was 2.6% for new prescriptions.³ The types and percentages of errors in the study were: prescription deficiencies 51%, prescription errors 29%, patient comprehension issues 12%, and significant drug interactions 9%. In a survey conducted in 1996 of 1000 community pharmacists, more than 50% reported making a dispensing error within a two-month period.⁴ Many of these errors were caught before they reached the patient, but these “near-misses” illustrate the potential for future errors. In fact, many health care providers feel that the numbers of medical and medication errors are greatly underestimated due to poor documentation and lack of reporting in the U.S. The number of actual errors is believed to be much higher.

Before discussing root cause analysis, prevention, and reduction strategies, it is important to define what exactly a medication error is. The National Coordinating Council on Medication Error Reporting and Prevention defines a medication error as: “Any preventable event that may cause or lead to inappropriate medication use or patient harm, while the medication is in the control of the health care professional, patient or consumer. Such events may be related to professional practice, health care products, procedures, and systems including: prescribing, order communication, product labeling, packaging, nomenclature,
compounding, dispensing, distribution, administration, education, monitoring and use”. As one can observe
from this definition, medication errors encompass a wide variety of activities that occur during the
medication use process. It is also important to note that non-preventable adverse drug events (ADEs) are
not considered medication errors because their occurrence cannot be predicted nor prevented. For
example, if a patient had an allergic reaction to red dye #5 from a medication but did not know they were
allergic. This would not be considered a medication error. However, if the patient had an allergic reaction to
penicillin documented in her patient profile and the pharmacist dispensed amoxicillin 250mg, this would be
considered a medication error.

Unfortunately, even in the best designed system of providing medications to patients, errors still do
occur. A common misconception is that many medication errors are made by incompetent health care
professionals that have a history of making several errors over time. In general, it is rare for a health care
professional to make multiple medication errors. More often, a medication error occurs due to a breakdown
in the medication use process. This breakdown often occurs at more than one step in this process. The
medication use process consists of five major categories all of which have several steps within each
including: prescribing, documenting, dispensing, administering, and monitoring. The Institute for Safe
Medication Practices (ISMP) estimates that the average number of steps in the medication use process is
40. A breakdown in any one of these steps has the potential to cause a medication error. Most health care
professionals think that many of the errors that occur in the medication use process happen in dispensing.
However, this may not be the case. A study by Bates et al. found that 56% of errors occur during
prescribing, 34% during administration, 6% during transcription and only 4% during dispensing.5

Root Cause Analysis

Whenever a medication error occurs, a root cause analysis should be conducted. In general, root cause
analysis in undertaken after a medication error has already happened. Root cause analysis should focus
primarily on the systems and processes to determine why an error occurred. In general, it should not focus
on individual performance issues. Any root cause analysis should be extremely thorough and include
special causes as well as common causes for the error in question. This analysis should include individuals
at several levels within the pharmacy department and leaders within the organization. A review of literature
regarding how other pharmacies and institutions have dealt with this type of error should also be
undertaken. When conducting a root cause analysis, the focus should be on answering the following
questions: What exactly happened? Why did it happen? At which step(s) did the medication use process
breakdown or did a failure occur? What happened immediately before the error occurred? What processes
or systems underlie the cause of the error? What strategies can be implemented to help ensure the error
does not occur again? Have there been any other “near-misses” similar to this type of medication error?
What kind of assessment plan will be put in place to monitor the outcomes of any prevention technique that
is implemented? Once the root cause of the problem is identified, an action plan, follow-up, and
measurement strategy must be implemented to prevent further errors of this type. However, health care
institutions are strongly encouraged to take a proactive approach and focus a significant amount of time on
the prevention of medication errors.

If a health care organization promotes a non-threatening attitude toward medication errors and stresses
open communication, this will improve the chances of success of root cause analysis. Employees in an
organization must believe that error reduction is everyone’s business and should constantly be aware of
potential weaknesses and vulnerability in the medication use process within their organization. Finally,
some types of errors occur frequently but do not cause serious harm to a patient. Some organizations may
not have the financial and manpower resources to conduct root cause analysis for every error. In this
scenario, aggregated root cause analysis or batch analysis may be the best solution. The process and
framework for aggregate root cause analysis is similar to root cause analysis except a subset of similar
errors is selected for comprehensive review and action planning.
Failure Mode and Effects Analysis

Another type of error analysis is Failure Mode and Effects Analysis (FMEA). This type of analysis has been around for years and has been used most often in very high risk environments and processes such as nuclear waste storage. However, there are applications in the preventing of medication errors. One of the main questions FMEA asks is, given the possibilities for failure, what are the potential consequences? In FMEA, it is assumed that errors are going to occur and are predictable. It attempts to anticipate future errors and design a process or system that minimizes their impact. For this reason, FMEA has sometimes been described as a risk assessment mechanism. It looks at the system proactively instead of retroactively like in root cause analysis. Let's look at a specific example. Let's assume a large chain of pharmacies is conducting an FMEA for the medication Toprol XL 50mg. FMEA asks the questions what will happen if a pharmacist....

1) mistakes Topamax 50mg for Toprol XL 50mg because it sits next to it on the shelf
2) dispenses the wrong quantity of drug
3) omits information from the directions on the label
4) dispenses the wrong generic for Toprol XL (dispenses immediate release metoprolol 50mg)
5) types the wrong dosage on the label
6) fills the prescription for the wrong patient (The husband’s name instead of the wife’s)
7) does something that could produce any other kind of medication misadventure or mistake

FMEA analysis should reveal specific steps that must be put in place to address potential errors with significant impacts. These are known as “error traps” and are important in helping to prevent future medication errors and improve patient safety. These error traps are essentially safety systems or safety nets. In the example above, some changes to the process to prevent these errors with Toprol XL might include:

1) Storing all strengths of Topamax somewhere else in the pharmacy away from the Toprol XL.
2) Train their pharmacists to always check and verify the label on the prescription three times and make this a part of their normal workflow routine.
3) When dispensing generic metoprolol, place an alert message on the computer to alert the pharmacist to check whether the metoprolol to be dispensed is immediate release or sustained release.
4) If the person who carries the health insurance is the husband, do not allow the computer system to automatically place the husband’s name in the patient name block on the filling screen of the computer.
5) Train the pharmacists when counseling the patient to have the patient verify who the medication was for, how they were told to take it, and what did the physician tell them to expect?

One thing pharmacists should not rely on is technology to solve the problem. Technology and automation can augment and enhance medication safety and reduce errors. However, when new technologies (bar coding, new software, etc.) are implemented on top of a faulty medication use process or workflow system, medication errors many times become more frequent. Nearly 20% of the medication errors reported to a national database in 2003 pertained to problems with computerization and automation. Pharmacists and health care practitioners should never use technology or automation to solve an organization’s problem with medication errors. Failure mode and effects analysis (FMEA) should be conducted first before any new technologies are introduced into the medication use process.
Prevention of Medication Errors - Dangerous Abbreviations

There are several techniques that can be used within a health care organization or institution to help prevent and reduce the number of medication errors. One of the major causes of medication errors is the use of dangerous abbreviations. The Joint Commission on the Accreditation of Healthcare Organizations (JCAHO) reviews and writes National Patient Safety Goals on a yearly basis. JACCHO has identified nine dangerous abbreviations that should not be used by health care organizations. These abbreviations are:

1) “U” should not be used for “units”. It is often misread as “0”, “cc” or “4”. Recommendation: write out “unit”.
2) “IU” should not be used for “International unit(s)”. It is often misread as IV (intravenous) or “10”. Recommendation: write out “international units”.
3) “qd, or QD” should not be used for “every day” or “daily”. It is often misread as four times daily (QID). Recommendation: write out “daily”.
4) “qod, or QOD” should not be used for “every other day”. It is often mistaken for daily (QD) or four times daily (QID). Recommendation: write out “every other day”.
5) “MS” should not be used for “morphine sulfate”. It is can be misinterpreted as “magnesium sulfate”. Recommendation: write out “morphine sulfate”.
6) “MSO4” should not be used for “morphine sulfate”. It can be misinterpreted as “magnesium sulfate”. Recommendation: write out “morphine sulfate”.
7) “MgSo4” should not be used for “magnesium sulfate”. It can be misinterpreted as “morphine sulfate”. Recommendation: write out “magnesium sulfate”.

The final two mandatory recommendations have to do with decimal points and zeros. The improper use of zeros and decimal points continues to be one of the leading causes of medication errors. The rules regarding the use of decimal points and zeros are very simple. 1) Never put a zero after a decimal point. These are called “trailing zeros”. For example: a prescription for morphine sulfate 10mg should never be written “morphine sulfate 10.0mg. The decimal point in this prescription could be overlooked and the patient could receive 100mg instead of 10mg, a ten-fold increase in dose and potentially fatal. 2) Always put a zero in front of a decimal point. These are called “leading zeros”. For example: a prescription written for morphine sulfate .1mg could be mistaken for 1mg because the decimal point was not seen. It should be written as 0.1mg.

JCAHO also has several other abbreviations that it suggests should be avoided to reduce the potential for medication errors and may be added to the official “Do Not Use” list. These include 1) the symbols for greater than (">”) or less than (“<”) which could be mistaken for the number 7 or letter L, 2) apothecary units, 3) the “@” symbol which could be mistaken for the number “2”, 4) “μg” for micrograms, 5) “H.S.” or “h.s.” for half strength or bedtime, 6) “T.I.W.” for three times a week, 7) “S.C. or S.O.” for subcutaneously, 8) “d/c” for discontinue or discharge, 9) “c.c.” for cubic centimeters (The more appropriate substitution for c.c. is to use “mL” or write out “milliliters”), and 10) “A.S., A.D., and A.U.” for left, right, and both ears, and “O.S., O.D., and O.U.” for left, right and both eyes. With many of these abbreviations, JCAHO recommends that they should be written out.

In addition to dangerous abbreviations for directions and doses, inappropriate abbreviations and shortcuts regarding drug names are also potentially just as serious. Many physicians and pharmacists devise their own abbreviations in an attempt to save time and improve efficiency. The way to prevent these type of errors is very simple. Don’t abbreviate drug names. Take the extra time and write the entire name of the drug. Listed below are some common drug name abbreviations and what they might be mistaken for:

1) “AZT” for zidovudine, but mistaken for azathiprine
2) “MTX” for methotrexate, but mistaken for mitoxantrone
3) “TAC” for triamcinolone, but mistaken for tetracaine, adrenalin, or cocaine
4) “CPZ” for Compazine, but mistaken for chlorpromazine
5) “HCTZ” for hydroclorothiazide, but mistaken for hydrocortisone
6) “PIT” for Pitocin, but mistaken for Pitressin
7) “HCT” for hydrocortisone, but mistaken for hydrochlorothiazide
8) “ASA” for aspirin, but mistaken for ascol
9) “ARA-A” for vidarabine, but mistaken for cytarabine (ARA-C)
10) “HCI” for hydrochloric acid, but mistaken for potassium chloride
11) “NITRO Drip” for Nitropusside, but mistaken for nitroglycerin
12) “NORFLOX” for norfloxacin, but mistaken for Norflex

Now that we have identified several abbreviations that have the potential to cause medication errors, it is appropriate to discuss some general tips to help prevent medication errors from inappropriate abbreviations.

1) Pharmacists and other health care providers should become familiar with error-prone abbreviations. They should recognize patterns in the use of these types of abbreviations and use that as a point to educate the health care provider who is using them about their potential danger. 2) It is never justified to use abbreviations as a “short-cut” to reduce workload or improve efficiency. Patient safety should never be compromised in an attempt to accomplish either of these goals. 3) Never abbreviate any drug name when taking an oral prescription or order over the phone. Many pharmacists will use abbreviations for drug names and directions in order to “keep-up” with the fast pace of the person giving the prescription over the phone. If the oral prescription or order is being communicated too quickly, ask the person to please slow down and speak more clearly. 4) Verify any prescription you receive from a prescriber that contains problematic abbreviations or one the physician has “made-up” themselves. Do not try to make it a game among the pharmacists to try to decipher what the drug name or directions actually are. Here are several implementation tips from JACHO for eliminating dangerous abbreviations. These suggestions can be used within the pharmacy, health care institution, or as an tool for practitioners in the community. These and many more can be found at their website at www.jointcommission.org/PatientSafety/NationalPatientSafetyGoals/abbr_tips.htm.

1) Provide pocket-sized cards with the list of dangerous abbreviations
2) Place articles regarding dangerous abbreviations in employee and staff newsletters
3) Conduct a mock survey to test staff knowledge
4) Develop a “Do Not Use” abbreviation of the month
5) Develop medical chart inserts with the list of dangerous abbreviations
6) Create post-it notes, stickers, posters, magnets, and flyers in patient service areas
7) Offer to conduct an educational talk on this topic at a local physician’s office combined with lunch
8) Send professional letters to physicians who routinely use these abbreviations
9) Empower the nursing and office staff to help their physicians avoid these abbreviations through the use of contests, rewards, and incentives for participation
10) Provide customized mouse pads with the list

Errors From Verbal/Oral Prescriptions

Verbal/oral prescriptions or orders that are communicated via the telephone are particularly prone to medications errors. These types of prescriptions have multiple steps where a medication error could likely occur. Each oral prescription requires the pharmacist to hear the order correctly, understand what is being communicated, process the information mentally, and write down the correct information. There are many things that can interrupt or interfere with this process. Bad pronunciation by the nurse or doctor, voice inflections, a noisy environment, distractions, interruptions during the process, lack of knowledge of the drug being called-in, etc can all affect the accuracy of the oral prescription. Here are a few tips to help prevent medication errors with oral prescriptions: 1) If the oral prescription or order is being communicated too quickly, ask the person to please slow down and speak more clearly. Also, ask the person to enunciate the information slowly and clearly. It is not rude to ask someone to please speak-up. 2) Many times the nurse cannot read the doctor’s handwriting and will try to make an educated guess. A common occurrence is the nurse saying “Well, it looks like Prevacid 30mg”. Ask the nurse to verify the drug with physician and call you back. 3) Never rely on the patient’s profile to help decipher a drug name or directions. Many times if a nurse cannot read the doctor’s handwriting she will ask the pharmacist, “How did the patient take it last time”. Then she will tell the pharmacist to use the same directions on this prescription. 4) If someone is communicating a prescription to a pharmacist and cannot be understood, shows a lack of knowledge of the drug, or seems unsure of what they are calling-in, ask to speak to someone else. 5) Ask the person to spell drug names that may be similar to others. Sometimes an “S” sounds like an “F” and a “D” sounds like a “B”. 6) Pronounce digits separately when providing a strength or dose. For example: Lisinopril 20mg
should be communicated, “Lisinopril twenty milligrams… that’s two zero milligrams”. 7) When receiving an oral prescription, go to a quiet place in the pharmacy free from distractions. Also, tell your technicians never to interrupt you in the middle of taking an oral prescription. If you do get interrupted, have the person giving you the oral prescription over the phone start over. 8) Finally, once the pharmacist completes the transcription of a verbal or oral prescription, take the time to verify the information with the person calling-in the prescription.

Medication Error Reduction Tips for Pharmacists

The Institute for Safe Medication Practices (ISMP) has a number of resources that pharmacists and health care practitioners can use to help reduce medication errors. Their website has several educational tools to assist in this process. It is definitely worth the time to browse their website at www.ismp.org and see what they have to offer. Some of their suggestions for pharmacists to use to reduce medication errors along with others are:

1) Use the same process or workflow every time you fill or check a prescription. If you become interrupted in the middle of checking a prescription, start over from the beginning.
2) Educate your support staff not to interrupt you during the prescription checking process. Almost everything can wait a few minutes until you are done.
3) Check the prescription label against the prescription at least three times.
4) Have another pharmacist verify any calculations you do. Make that person do the calculation from scratch and on their own. Do not give them your math work and have them verify it.
5) Keep the original prescription order, label, and stock medication container together during the entire process from start to finish.
6) Monitor the medical literature for information on newly discovered medication errors that have occurred in your practice setting.
7) Pharmacists should use auxiliary labels and stickers on the prescription bottle more prudently when it may prevent a medication error such as “shake well”, “for the eye”, “for the ear”, “rectally”, “refrigerate”, etc. However, pharmacists should not overuse auxiliary labels or use more than three per bottle if possible.
8) Develop, implement, and follow a medication error avoidance plan.
9) Establish a quality control procedure for double-checking prescriptions waiting to be picked up with the information in the computer and on the original prescription.
10) Create a safe work environment by using optimal lighting in prescription filling and verification areas, use a resizable scanned prescription for viewing, and minimize distractions.
11) Create shelf “tags” or “red flags” for look-alike or sound-alike drugs on storage shelves.
12) Create a formal process to document and evaluate medication errors and “near-misses” (those errors that were caught or almost occurred)
13) Request resources from your employer that will facilitate error reduction
14) Constantly evaluate new technologies or dispensing processes for medication error potential.
15) Make regular follow-up phone calls to patients to assess how their drug therapy is going and inquire about adverse events, side effects, and/or any changes in the patient’s medication or medical history.
16) Report errors and near misses to both internal and external medication error reporting systems to help others learn how to avoid similar problems and situations.

The goal of every pharmacist is to follow the five “Rs”: right drug, right patient, right dose, right time, and right route. However, pharmacists must realize that medication errors are a fact of life and will occur. Therefore, pharmacists should empower their patients to become actively involved in their own health care and not become a passive patient. If a patient thinks something may be wrong, they should not feel hesitant to call their physician and/or pharmacist and discuss the problem. Pharmacists need to nurture and encourage this attitude in all their patients. Any health care practitioner that becomes upset when a patient takes an active role in their own health is not acting in the best interest of their patients. Patients can make a big impact in medication error reduction. Pharmacists should actively educate patients on these principles and make it a part of their regular counseling to their patients.
What Patients Can Do

1) Make sure that you make the pharmacist aware of all prescription and non-prescription medication they are taking. This also includes home remedies, herbal products, supplements, and vitamins. Many patients fail to alert health care practitioners of the later due to the potential for ridicule. Pharmacists should make patients feel comfortable in disclosing this information and not to judge the patient on these behaviors, but educate them.

2) Take the time and have the pharmacist counsel you.

3) Make sure you repeat back the most important points covered during patient counseling to the pharmacist so that he/she knows you understand.

4) Keep a current list of all prescription, OTC, herbal products, supplements, and vitamins that you are taking. This list should be carried with you at all times and a copy should be in a prominent place at home (such as in an envelope taped to the refrigerator).

5) Keep medications in their original bottles and discard old/unused medications.

6) Have your doctor write the use for the medication on the prescription.

7) Contact your physician or pharmacist regarding any new side effects or problems you experience regarding your medications.

8) Store medications in a cool, dry place away from children and pets.

9) Try to use the same pharmacy for all your prescription needs. In the age of the $4 generics, it is very tempting to go to several different pharmacies in order to get the best deal, discount on gas, or free gift card. This destroys continuity of care and significantly increases the potential for a medication error.

10) Don’t be afraid to discuss other therapy options you have learned about with your doctor or pharmacist. When patients open a dialogue with health care practitioners, everyone benefits. Open communication is a good thing.

The reduction of medication errors is everyone’s responsibility and should be taken very seriously. The information provided above should provide you with some good tools to help keep your patients safe by reducing the potential for medication errors in your practice.

References


The views contained in this program are not intended as legal advice. Pharmacists should always consult their own attorney or the New York Board of Pharmacy when questions or issues regarding the practice of pharmacy arise.
Continuing Education Test Questions. Using the Test Answer sheet on the last page, please circle the correct response for each question. A passing grade of 70% must be obtained to receive continuing education credit. CE statements of credit will be mailed within 2 weeks of receiving your answer sheet.

1. In the study by Rupp et al., the most common type of medication error was
   a) significant drug interactions
   b) prescription deficiencies
   c) patient comprehension issues
   d) hand writing issues

2. Non-preventable adverse drug events (ADEs) are not considered medication errors.
   a) true    b) false

3. Most medication errors are made by incompetent health care professionals with a history of making medication errors.
   a) true    b) false

4. Which of the following are true?
   a) It is estimated that average number of steps in the medication use process is 5.
   b) A study by Bates et al. found that most errors occur during dispensing.
   c) Medication errors usually result due to a breakdown in the medication use process.
   d) a and b are true
   e) b and c are true

5. Which of the following are true regarding root cause analysis?
   a) Root cause analysis focuses on systems and processes.
   b) Root cause analysis should not focus on individual performance issues.
   c) Root cause analysis occurs after a medication error has already occurred.
   d) a and c are true
   e) a, b, and c are true

6. A non-threatening attitude and open communication will improve the chances of success of root cause analysis.
   a) true    b) false

7. Which of the following are true regarding Failure Mode and Effects Analysis (FMEA)?
   a) FMEA attempts to anticipate future errors and design a process to minimize them.
   b) FMEA assumes errors are predictable and going to occur.
   c) FMEA is sometimes referred to as a risk assessment mechanism.
   d) a and b are true
   e) a, b, and c are true

8. Error traps are used to analyze past medication errors.
   a) true    b) false
9. Which of the following are true regarding technology and automation?
   a) Nearly 50% of medication errors reported in 2003 pertained to computerization issues.
   b) A pharmacy should rely extensively on technology to solve medication error issues.
   c) FMEA should be conducted before new technologies are introduced.
   d) a and b are true
   e) a, b, and c are true

10. Which of the following abbreviations identified by JACHO should not be used?
    a) “qod” for every other day
    b) “MSO₄” for morphine sulfate
    c) “IU” for units
    d) a and c should not be used
    e) a, b, and c should not be used

11. Which of the following are incorrectly written according to JACHO?
    a) “alprazolam .5mg”
    b) “amoxicillin 250.0mg
    c) “Lantus® insulin 25U daily”
    d) a and b
    e) a, b, and c

12. Physicians should not use shortcuts or abbreviations for drug names when writing prescriptions.
    a) true
    b) false

13. Which of the following tips may help prevent medication errors from inappropriate abbreviations?
    a) Health care professionals should become familiar with error-prone abbreviations.
    b) Abbreviations can be used as short-cuts to improve efficiency.
    c) Verify any prescription with a problematic abbreviation with the prescriber.
    d) a and c
    e) a, b, and c

14. Which of the following could cause a medication error when a pharmacist is receiving an oral prescription?
    a) Interruptions by the pharmacy staff during the process
    b) Voice inflections of the nurse
    c) Bad pronunciation by the nurse of a drug name
    d) b and c
    e) a, b, and c

15. Tips for pharmacists to help reduce medication errors include………..
    a) Create shelf tags to help alert pharmacists for look-alike and sound alike drugs
    b) Constantly evaluate new dispensing processes for medication error potential.
    c) Keep the prescription order, label, and stock medication bottle together during the entire dispensing process.
    d) a and c only
    e) a, b, and c
16. A pharmacist calculated a loading dose of digoxin for a patient. To make sure he did the calculation correctly, he gave a copy of his math work on a piece of paper to another pharmacist to verify. Was this the correct procedure?
   a) Yes     b) No

17. According to ISMP, “near miss” errors in which the patient was not harmed should not be reported.
   a) true     b) false

18. Pharmacists should check the label against the prescription at least ________ time(s).
   a) one
   b) two
   c) three
   d) ten

19. Which of the following is not one of the five “Rs”?
   a) right dose
   b) right time
   c) right drug
   d) right route
   e) all of the above are included in the five “Rs”

20. What can patients do to help prevent medication errors?
   a) Keep a current list of all medications.
   b) Have the pharmacist counsel you on your prescription drugs.
   c) Never discuss other drug therapy options with your doctor or pharmacist.
   d) a and b
   e) a, b, and c
Continuing Education Test Answer Sheet

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20) A B C D E

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