
Preventing Medication Errors in Pharmacy Practice for New York Pharmacists

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Learning Objectives

- 1) Describe the process of root cause analysis (RCA)
- 2) Describe failure mode and effects analysis (FMEA) and its application in pharmacy practice
- 3) Describe the role dangerous abbreviations play in medication errors
- 4) Describe medication error reduction and prevention procedures
- 5) Describe ways to improve patient medication safety
- 6) Examine different strategies to aid in the reduction of medication errors
- 7) Examine common errors made by pharmacists and how to prevent them
- 8) Describe the potential for medication errors with electronic prescribing

What do you think your chances are of making a dispensing or medication error? Let's consider this scenario. A pharmacist fills 225 prescriptions per day during an average day working in a community pharmacy. That's 1,125 prescription per week, 55,125 prescription per year (assuming 3 weeks of vacation), or approximately 1.65 million prescriptions during a 30 year career in pharmacy. What do you think your chances are of making a medication error? The odds are stacked against all of us. We are all human and errors do occur. If you have not made a medication error yet in your career as a pharmacist, you will at some point. You need to think about when that moment occurs, how will I handle that situation? You need to think through the following questions so you are better prepared when this unfortunate situation happens.

- 1) What do I need to do to take care of the patient first and foremost when a error occurs?
- 2) What do I say to the patient and what is my response to them?
- 3) What is not going well with my pharmacy's workflow?
- 4) How will this affect my practice of pharmacy in the future?
- 5) What type of error analysis do I need to conduct?
- 6) What type of reporting is required of me if an error occurs?
- 7) Do I really have a patient safety focus in my practice of pharmacy?
- 8) Do I need additional training and education?
- 9) How do I prevent medication errors from happening in the future? I know we have had some "near-miss" errors that were caught before they left the pharmacy.

These are just a few questions every pharmacist should think about before an error actually occurs, so they are better prepared when one does happen.

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Facts About Medication Errors In Practice

Fact: It is a common misconception that most 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.

Fact: Even in the best designed attempt to automate the medication use process, errors still do occur. Automation does not eliminate all medication errors. In fact, it can create new types and classes of medication errors.

Fact: Bar codes don't prevent all medication errors.

Fact: Medication errors usually occur due to a breakdown in the medication use process. This breakdown often occurs at more than one step in this process.

Fact: The medication use process consists of five major categories, all of which have several steps within each including: prescribing, documenting, dispensing, administering, and monitoring.

Fact: 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.

Pharmacists and health care professionals became more aware of the serious problem of medication errors with the release of the report by the Institute of Medicine, "To Err is Human-Building a Better Health System".¹ In this report it is estimated that between 44,000 and 98,000 Americans die each year of medical errors 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 Institute of Medicine a few years later "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 In 2014, the National Council on Patient Information and Education (NCPIE) conducted an online study to determine patient and health professional knowledge and attitudes about the risks of medication and medication safety issues³. The study found that 62% of patients were not aware of the safety warnings regarding their own medications. Of those patients who were aware of a safety issue with their medications, 75% did not recall what that warning was or which medication the warning was intended. Fifty percent of patients in the study responded that they prefer both written and verbal information when receiving a prescription from their physician and 48% prefer both from their pharmacist. When patients were asked where they receive their information on medication risks and warnings, 59% indicated the Internet, 75% indicated their physician and 55% indicated their pharmacist. The Institute for Safe Medication Practices (ISMP) feels that pharmacists are the most qualified to take the professional responsibility for medication safety and error prevention.⁴ Based on the data from the NCPIE study, pharmacists have some work to do to better educate their patients on medication safety and risk.

Before discussing root cause analysis, it is important to understand and discuss how a medication error is defined. 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". This is a very comprehensive definition of what constitutes a medication error and includes 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 or prevented. For example: A pediatric patient had a gastrointestinal reaction to a medication due to the gluten in it, but did not know they had Celiac Disease. This would not be considered a medication error. However, if the patient had an allergic reaction to penicillin

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documented in her patient profile and the pharmacist dispensed amoxicillin 250mg, this would be considered a medication error.

Even though pharmacies try to incorporate countermeasures like technology, bar code scanning, and automated dispensing robots to improve patient safety, medication errors still do occur. Even in the best designed systems to maximize patient safety, errors do occur. It is a common misconception 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. 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. Finally, 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 Even though only 4% of medication errors occur during the dispensing part of the medication use process, pharmacists can have a significant impact in reducing medication errors in the other parts and pieces of the process. Pharmacists should always realize that medication error prevention safety needs to occur at every step of the medication use process. Pharmacists should develop a team approach to achieve this goal with prescribers, nurses, patients, and even manufacturers in order to maximize patient safety and minimize patient harm.

Root Cause Analysis

Every healthcare professional will be involved in some type of medication error during their professional career. It is inevitable. When a medication error does occur, the organization and/or health care professional should conduct a root cause analysis. This type of analysis is done after a medication error has occurred. In root cause analysis, the focus should be on the processes, procedures, and systems in the medication use process to determine why an error occurred. One misconception is that this analysis should focus on individual performance issues. This is not the case. It is a process-driven analysis. When conducting a root cause analysis, the individuals involved should be very thorough in examining the process that preceded the error. It should also include special causes, as well as, common causes regarding the error in question. In root cause analysis, pharmacists, technicians, interns, managers, and the director of pharmacy should be included and involved with this process. Before getting started, you should do a complete medical and pharmacy literature review to determine how other organizations have addressed this type of error. When beginning a root cause analysis, the focus should be on finding answers to the following questions: What happened (in detail)? Why did it happen? What occurred just before the error? At which step(s) did the medication use process breakdown or did a failure occur? What processes or systems underlie the cause of the error? What possible strategies can be implemented to help ensure the error does not occur again? Have there been any other “near-misses” or other medication errors that closely-resemble this one? What kind of evaluation and/or assessment plan will be implemented to monitor the outcomes of any error prevention technique or process change that is implemented? Once the “root cause” of the error has been determined, an action plan, follow-up, measurement strategy, evaluation, and assessment plan must be implemented to prevent future medication errors of this type. Even though root cause analysis is done after an error occurs, healthcare organizations should take a proactive approach to reducing errors and focus a large amount of time and resources 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 responsibility and should constantly be aware of potential weaknesses and vulnerability in the medication use process within their organization. Finally, some

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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 (FMEA)

Many organizations erroneously wait until a medication error happens before they decide to see if the medication use process in their organization is broken. This may be viewed as a backwards approach to reducing medication errors. It is important to employ root cause analysis after an error occurs, but healthcare organizations should be more proactive in their approach of preventing medication errors. Failure Mode and Effects Analysis (FMEA) is one way to accomplish this and should be considered as part of a comprehensive risk-reduction strategy regarding medication safety. The primary goal of FMEA is to systematically identify areas of potential failure in the medication use process at your institution. This proactive approach should be discussed in the context of new medications, clinical guidelines or therapies that are added to your practice site. 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 prevention of medication errors. One of the primary 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 as in root cause analysis. 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. For example: Some changes to the process to prevent errors with immediate release metoprolol versus sustained release metoprolol might include:

- 1) Storing metoprolol and sustained release metoprolol in different sections of the pharmacy.
- 2) Train your 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) Place an alert sticker on the sustained release metoprolol to alert the pharmacy staff of the possibility of a mix-up with immediate release metoprolol.
- 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?

FMEA should always be conducted when a pharmacy decides to stock a new product or when a new drug is introduced. This analysis attempts to address potential medication errors and patient safety issues before an actual error occurs. The best way to illustrate how this can be accomplished is with a case example: Let’s consider the drug Sivextro[®] (tedizolid), which was approved in 2014. The drug is indicated to treat adults with acute bacterial skin and skin structure infections including MRSA. When a pharmacy first receives this drug in their inventory, they should have conducted FMEA. This analysis should include consideration of many factors regarding the drug beyond the standard of how it will be dispensed, stored, and stocked. Step 1: The pharmacy staff should discuss how the product will be prescribed and what place the drug has in current patient therapy. The pharmacy staff should consider the following questions: What clinical information is most relevant about this drug? How does it differ from other therapies used to treat the same thing? Which patients are most likely to benefit from the drug? How will it be ordered and where will it be placed on the pharmacy’s shelves? What information regarding the drug should be conveyed to the patient? What potential problems might patients encounter when taking this medication? Is this medication more effective than Zyvox[®] (linezolid)? The

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literature suggests that Sivextro[®] may cause less GI problems, serotonergic effects and bone marrow suppression than Zyvox[®]. Is this true? Are these differences clinically significant to the patient? Does the physician know that Sivextro[®] does not require monitoring like Zyvox[®]? Is Sivextro[®] therapeutically superior to Zyvox[®]? Step 2: What could potentially go wrong when this drug is prescribed and dispensed to a patient? What are the most dangerous side effects? What are the most important pieces of information that need to be communicated to the patient? The pharmacy staff should systematically and methodically examine where errors may occur, not just in the dispensing process, but in all steps of the medication use process. For example: When an oral prescription for Sivextro[®] is called in to the pharmacy, what might it be mistaken for? What drugs might it be confused with? Sivextro[®] sounds a little like Silenor[®] or Savella[®]. Will physicians and prescribers realize that Sivextro[®] is usually dosed once daily for 6 days and Zyvox[®] (which is similar) is usually dosed twice daily for 10-14 days? How much does it cost and can patients afford it? Do prescribers understand that a course of therapy with Sivextro[®] is very expensive (around \$2,000) but may be cheaper than Zyvox[®]? When placed in the pharmacy's inventory, what drugs will it be sitting next to? What could you do to make sure the pharmacist or technician grabs the correct medication? Maybe the drug should be stored on another shelf, an alert sticker could be placed on the bottle, or a computer alert message may warn the pharmacist. These potential sources of medication errors must be anticipated and processes put in place to help prevent these types of errors. Anticipating these potential errors and addressing them in advance is the key. Step 3: The pharmacy staff needs to determine the likelihood of these types of errors occurring and what are the consequences of these errors. Some consequences may be more severe than others and those types of potential errors need to be addressed first and with the most definitive measures. The goal is to detect the error before it occurs and minimize the consequences. Step 4: What types of processes are already in place to prevent these types of errors from occurring? The pharmacy may have a very good error prevention process in place for oral prescription products with sound-alike names or computer alerts during the dispensing process. This could be applied very easily to Sivextro[®]. Step 5: Set up an evaluation and feedback system to determine if errors are still occurring with this medication. Also, the pharmacy needs to regularly evaluate how successful the counter-measures or processes implemented to prevent errors with Sivextro[®] have performed. As you can see from this case, a thorough FMEA is more than just making sure the pharmacist does not grab the wrong drug from the shelf before it is placed in a bottle and dispensed to the patient. All clinical aspects and nuances of the drug must be considered in order to have a comprehensive medication error prevention program in place before this drug is dispensed to the first patient. Pharmacists are strongly encouraged to take the time and follow a similar process when any new medication is introduced into the pharmacy's inventory.

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 reviews and writes National Patient Safety Goals. The Joint Commission has identified several 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 can be misinterpreted as "magnesium sulfate". Recommendation: write out "morphine sulfate".

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- 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 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/kg/day could be mistaken for 1mg because the decimal point was not seen. It should be written as 0.1mg.

JCAHO, ISMP, and other patient safety organizations have also identified several other abbreviations that should be avoided to reduce the potential for medication errors and may be added to an official “Do Not Use” list for your pharmacy or institution.

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. Mistaken for “mg”.
- 5) “H.S.” or “h.s.” for half strength or bedtime. These two abbreviations are confused with each other frequently.
- 6) “T.I.W.” for three times a week. Mistaken for three times daily or twice weekly.
- 7) “S.C. or S.Q.” for subcutaneously. Mistaken for “sublingual” or “5 every”.
- 8) “d/c” for discontinue or discharge. This abbreviation is frequently misinterpreted.
- 9) “c.c.” for cubic centimeters (The more appropriate substitution for c.c. is to use “mL” or write out “milliliters”).
- 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.
- 11) “/” is used to separate doses or strengths. It is often mistaken for the number “1”.
- 12) “UD” for use as directed. Mistaken for “unit dose”.
- 13) “+” is used for “plus” or “and”. Mistaken for the number “4”.
- 14) “q6PM” is used for nightly at 6PM. Mistaken for every 6 hours.
- 15) “ss” is used for one-half or sliding scale for insulin. Mistaken for “55”.
- 16) “qn” is used for nightly. Mistaken for “qh” or every hour.
- 17) “IN” is used for intranasal. Mistaken for “IV” or “IM”.
- 18) “IT” is used for intrathecal. Mistaken for various other routes of administration such as “intratracheal”.

The best way to avoid any of these types of errors is to always write the words out on any prescription or oral order.

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 types 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 azathioprine
- 2) “MTX” for methotrexate, but mistaken for mitoxantrone
- 3) “TAC” for triamcinolone, but mistaken for tetracaine, adrenalin, or cocaine

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- 4) “CPZ” for Compazine, but mistaken for chlorpromazine
- 5) “HCTZ” for hydrochlorothiazide, 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) “HCl” for hydrochloric acid, but mistaken for potassium chloride
- 10) “NITRO Drip” for Nitroprusside, but mistaken for nitroglycerin
- 11) “NORFLOX” for norfloxacin, but mistaken for Norflex
- 12) “APAP” is not recognized as being the abbreviation for acetaminophen

A recent article has called attention to a couple of other drug names that are commonly confused. Pharmacists should be especially diligent when receiving an oral prescription for these drugs. These include: a) Enablex and Effexor XR being confused, b) Tenex and Xanax being confused, and c) Nuedexta and Neulasta being confused⁶. It is always good advice for the prescriber to include the indication with the prescription to help prevent look-alike and sound-alike drug names. It is also a good idea to use both brand and generic names when issuing a prescription to a patient.

Verbal/oral prescriptions or orders that are communicated via the telephone are particularly prone to medication 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 Nexium[®] 40mg”. 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, strength, or directions. Many times if a nurse cannot read the doctor’s handwriting she will ask the pharmacist, “How did the patient take it the last time?” Then she will tell the pharmacist to use the same directions on the new 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.

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

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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 The Joint Commission and ISMP for eliminating dangerous abbreviations. These suggestions can be used within the pharmacy, health care institution, or as a tool for practitioners in the community.

- 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

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^{7,8,9}:

- 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) Check the prescription against the label at least three times.
- 3) 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.
- 4) Keep the original prescription order, label, and stock medication container together during the entire process from start to finish.
- 5) Monitor the medical literature for information on newly discovered medication errors that have occurred in your practice setting.
- 6) 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.
- 7) Develop, implement, and follow a medication error avoidance plan.
- 8) 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.
- 9) Create shelf “tags” or “red flags” for look-alike or sound-alike drugs on inventory shelves.
- 10) Create a formal process to document and evaluate medication errors and “near-misses”.
- 11) Request resources from your employer that will facilitate error reduction.
- 12) Constantly evaluate new technologies or dispensing processes for medication error potential.
- 13) 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.
- 14) 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.

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- 15) Use the following websites *www.ismp.org*, *www.nccmerp.org*, *www.safemedication.com*, and *www.ahrq.gov* to learn more about medication error reduction tips and techniques.
- 16) Patients not being properly taught how to use dosing cups, droppers, and measuring spoons. They need to be educated by the pharmacist on how to measure the correct volume of liquid in these measuring devices, so patients do not overdose or under-dose the medication.
- 17) The work area should be kept free from clutter.
- 18) Area for final verification should be kept away from high traffic areas in the prescription department.
- 19) Drug bottles that are no longer used should be discarded or returned to the shelves.
- 20) Telephones should be located in an area where they cannot be a distraction to a pharmacist verifying prescriptions before dispensing.
- 21) Pharmacists should only fill one prescription at a time before switching containers or drugs.
- 22) Complete the entire process for each prescription (counting, checking, labeling, verifying) before moving on to the next one.
- 23) Make sure the dispensing area has adequate space to perform all activities.
- 24) Train technicians and interns to be the ones who answer the phone.
- 25) Interruptions when pharmacists are entering prescriptions into the computer and/or verifying prescriptions will absolutely not be tolerated. Train technicians and interns to never interrupt a pharmacist while he/she is in the process of the final verification before dispensing.
- 26) Keep the fax machine in an area away from the final verification area.
- 27) Make sure all areas of the pharmacy are well-lit. Some studies have suggested that light levels need to be increased for workers over the age of 45. Also, clean lighting fixtures on a regular basis. Lighting levels can be decreased by as much as 25% in fixtures that have not been cleaned for two years.
- 28) Create “break-periods” where pharmacists can step away from the dispensing process for a short time to avoid fatigue. It is better to make a patient wait a few minutes than have a pharmacist make a mistake due to eye-strain.
- 29) Make sure everyone in the pharmacy is properly trained on the system of how a prescription flows through the work flow system.
- 30) Technicians and interns should conform to the pharmacist’s work flow and habits, not the reverse.
- 31) Educate your technicians and interns to become “filters” for the pharmacists, but don’t let them overstep their boundaries and risk patient safety.
- 32) Always read the label, prescription, and drug container at least three times. This is called **Verification**³.
- 33) Have monthly meetings to discuss how work flow could be improved to reduce congestion, distractions, and improve patient safety.
- 34) Provide magnifying lens to aid in the reading of labels with very small print.
- 35) Make sure the lighting in the pharmacy is not casting a glare on computer screens used for data entry.
- 36) Store medication stock bottles in an organized and uncluttered area with at least one inch between bottles sitting side-by-side on the shelf.

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 of 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 have a big impact in medication error reduction. Pharmacists should actively educate patients on these principles and make it a part of their regular counseling.

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Electronic Prescribing

Electronic prescribing or e-prescribing has been touted as a significant advance towards preventing medication errors. E-prescribing can accomplish this by effectively dealing with many potential medication errors such as bad handwriting, ambiguous prescriptions, omitted information, and improper terminology. Some e-prescribing systems come equipped with clinical-decision support systems that are linked to comprehensive drug databases that aid in appropriate prescribing. Some of the most sophisticated systems can: a) help prescribers stay up to date on formulary changes and insurance coverage issues, b) alert prescribers of the most appropriate treatment options based on evidence based medicine, current clinical guidelines and best practices, c) facilitate data exchange between health care providers, d) maintain up-to-date, accurate and unbiased drug databases for drug therapy selection, e) provide prescribers with computer screen alerts and prompts to be careful of look-alike drugs and dosages that exceed clinical guidelines, f) provide prescribers with patient specific allergy and drug interaction alerts to help avoid potential adverse drug reactions, g) flag pre-existing conditions that would preclude the use of certain therapeutic options, and h) expedite refill requests from both patients and pharmacists. There is no doubt that electronic prescribing can be very beneficial in preventing many types of medication errors. However, this new technology is also causing a new generation of medication errors that pharmacists and practitioners must become aware. Some of these include:^{10,11,12}

- 1) One of the biggest shortcuts being used is when a physician writes the prescriptions in the patient's chart or on a sheet of paper and then has his/her nurse or medical assistant enter the drugs into the electronic prescribing system. The physician reviews all the entries at the end of the day and verifies they are correct. This is a recipe for disaster.
- 2) If a prescriber misspells the patient's name, the system may bring up the wrong patient. This can result in the prescriber ordering a prescription for the wrong patient.
- 3) A physician may forget to close one patient's record on the system before e-prescribing medications for the next patient. This could result in the first patient receiving prescriptions intended for the second patient.
- 4) Physicians may design their own "short-cuts" and enter them into the system to speed-up e-prescribing. For example: When prescribing amoxicillin 500mg, the physician only has to enter "Amox" and the system automatically brings up amoxicillin 500mg. Errors occur when the physician types Amox... and the system brings up the 500mg strength when actually the physician wanted the 875mg strength.
- 5) Physicians design their own "short-codes" for medication directions to speed-up prescribing. For example: The physician creates a short-code in the system called "CTID". Whenever this is typed into the system, the directions for the medication automatically inserted are "Take one capsule by mouth three times a day". Errors can occur when the wrong short-codes are chosen or misspelled.
- 6) Physicians setting "defaults" within the system. For example: A physician knows that 90% of his patients started on an ACE inhibitor are given enalapril 5mg, QD. This is set in the system as the default and automatically comes up on the prescribing screen. An error occurs when a patient is supposed to get a different strength of enalapril.
- 7) Like some pharmacists, prescribers turn-off some safety features of the system, such as drug interaction alerts or they get in the habit of just "entering" past them because many are clinically insignificant. This is sometimes referred to as "work-arounds".
- 8) A physician may inadvertently order laboratory tests instead of medications when options on the screen look like drug names.
- 9) The system is not kept properly updated with new clinical information as new clinical guidelines are introduced, new ADRs are discovered, and new drugs become available.
- 10) Individual prescribers can access the system's programming and can create overrides within the system. For example: A prescriber gets into the system and can override maximum dosage alert messages or delete them altogether.

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11) Sometimes prescribers cannot fit the entire directions for a medication in the “directions field” in the e-prescribing software. Therefore, the directions are placed in the “notes” section. Also, sometimes the medication directions are split between these two fields if they will not fit. This can cause the pharmacist to miss important information for the prescription.

In addition, commercially available e-prescribing systems from large, reputable companies are better than “locally developed” or “in-house” systems by small companies. These locally developed companies allow for too many customized changes to be made by the user and may have not gone through the rigorous testing that systems from larger, more established companies have. Many Boards of Pharmacy require approval of e-prescribing systems before they can be used. This is done to eliminate potentially serious problems before they are used in practice. When a practitioner chooses an e-prescribing system they should ask several questions including: the number of prescribers/organizations that are using the system, what type of testing was done with the system, ability of the system to interface with pharmacy computers, can the system be customized for institution specific alerts, and what types of fail-safe procedures, alerts, and error messages are available with the system, just to name a few. Pharmacists must be aware that e-prescribing will reduce many types of medication errors, but will lead to others we have not even dreamed of yet.

Other Error Reduction Strategies^{7,13}

1) The Independent Double Check - All pharmacists have been in the situation at one time or another where their “gut- feeling” was that something was just not right. Pharmacists should always heed the warnings signals these feelings may be sending. One way to help deal with this is an independent double check. This is a system in which a high-risk or high-alert medication order or prescription is verified separately by two different pharmacists. This verification (dosage, calculation, prescription interpretation, directions, use, etc) is done alone and apart from each other. Each pharmacist comes up with their own results/conclusions and then they are shared with one other. Pharmacies should develop a list of medications or processes (example: calculation of dosage adjustments) that should involve the independent double check system. It is often easy for an institutional pharmacist to find another pharmacist for a double check, but what about in a community pharmacy? This could be accomplished by having the double check done when another pharmacist comes into work later that day or by calling a reliable, “friend” pharmacist at another store.

2) Create a List of High-Alert Medications - High alert medications are those with the greatest potential to cause serious harm to the patient in the event of a medication error. Even though many of these medications are not commonly used, the potential for harm is significant. Through extensive research, The Institute for Safe Medication Practices has compiled a list of high-alert medications. These include: adrenergic agonists, adrenergic antagonists, anesthetics, antiarrhythmics, anticoagulants, chemotherapy drugs, hypoglycemics, inotropic drugs, sedatives and hypnotics, narcotic pain relievers, TPN solutions, and neuromuscular blockers just to name a few. Your pharmacy can create a list with other drugs on it as well. These drugs should be well marked as high-alert drugs that require special attention. You may also use special labeling, markings, color-coding, and computer alerts to make all health care personnel aware of the potential for serious harm when dispensing these medications to patients. Education and safety nets in the medication use process are the keys to the prevention of medication errors with these drugs.

3) Textbook Errata - Pharmacists and physicians rely on textbooks and drug references to answer crucial drug information questions when they arise in practice. Incorrect information in some textbooks and/or outdated information have the potential to cause serious medication errors. The decisions health care professionals make is only as good as the source of the information. References should be reviewed on an annual basis for accuracy, whether they are outdated, and replaced accordingly. The Institute for Safe Medication Practice

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maintains a database of reports on drug reference errors at www.ismp.org/Errata/default.asp. Finally, many pharmacies have gone to on-line references as the sole source of drug information. If this is the case, all pharmacists should be very familiar with how to use these on-line systems before “hardcopy” references are totally eliminated from the pharmacy.

4) Labeling suggestions - The Institute for Safe Medication Practices has issued some guidance for medication labels to reduce errors. Some of their suggestions include: a) the minimum font size for patient name, drug name, and dose should be 12 point font and not to use italic, oblique, narrow, or condensed font to “fit all the directions on the label”, b) use typographic cues (bolding and highlighting) for patient content only, c) maximize the amount of white space on the label to improve readability of the information on the label, d) use horizontal text only, e) use a white background for all labels, f) avoid awkward terms such as “twice”; instead use “two” or “2”, and g) use simplified language and avoid medical jargon. Example: If the directions are: 1 tablet SL, type the directions as “Place one tablet under the tongue”.

5) www.ConsumerMedSafety.org - The Institute for Safe Medication Practices has a website designed specifically for consumers. It is designed to help consumers take control of medication error reduction and prevention strategies. The website is a valuable resource to any consumer taking multiple medications and/or who wants to take an interest in their own healthcare. There are several pieces of the website that are worth mentioning. The website has a search feature where patients can enter the name of a prescription drug they are taking and the site searches for safety information and features of that drug. The Drug Alert section provides up-to-date information and alerts regarding safety issues with specific medications, newly identified problems, and issues with prescription and non-prescription drugs. The Safe Medicines section has great information about accidental poisonings and what to do in a poison emergency. Finally, the website has several other tools and resources for consumers, including mechanisms for consumers to confidentially report medication errors and the ability for the consumer to receive customized safety alerts on their own medications.

6) Proper Use of Oral Syringes¹³ - Health care organizations still need to address the problem of using parenteral syringes to administer oral medications. The use of a parenteral syringe (one with a Luer lock that can be attached to a needleless intravenous (IV) tubing system) to administer oral medications is a recipe for disaster. Even though many health care professionals think it would be impossible for a nurse to administer an oral medication provided in a parenteral syringe into an IV line, it still occurs far too frequently. It only takes one temporary memory lapse or distraction to cause this to occur. There are many reasons why the use of parenteral syringes for oral medications still occurs. a) The pharmacy department may forget to send up an oral syringe with an oral medication. b) The nursing unit may be temporarily out of stock of oral syringes or dosing cups. c) Due to overwork and large patient care loads, a nurse may grab a parenteral syringe to administer an oral medication to save time. d) A patient will not drink the medication from a dosing cup, so the nurse grabs a parenteral syringe to administer it to the patient. How can we combat this problem? 1) Keep all clinical areas well-stocked with oral syringes. 2) Establish high-quality training programs that educate nurses and pharmacists of the dangers of using parenteral syringes for oral products and their potential consequences. 3) Use auxiliary labels on oral syringes that clearly state “For Oral Use Only”. Apply the label on the plunger or tip so the label must be removed prior to administration. 4) Include warnings on the Medication Administration Record (MAR) such as “Administer Only with an Oral Syringe”. 5) Dispense liquid medications from the pharmacy in oral syringes whenever possible.

7) Get Rid of the Teaspoon¹⁴ - The word “teaspoon” or “teaspoonful” has been a bad word when used in directions for dosing liquid medications for years, yet will still continue to use it. The word teaspoon sends patients and caregivers the wrong message that it is appropriate to use kitchen silverware to give medications, which is never the case. It is well-known that the common household teaspoon delivers between 1.5mL and

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10mL of volume depending on its size, shape, and manufacturer. This can result in severe over or under dosing in a patient. Also, let's not forget the problems that can occur if a patient or caregiver grabs a tablespoon instead of a teaspoon. This could result in a 300% overdose in the patient. In November 2014, the Consumer Healthcare Products Association (CHPA) updated the OTC industry's voluntary guideline to recommend that "spoon" labeling be deleted and mL labeling should be the only dosing labeling used. This recommendation should also apply to directions on all prescription products as well. In recent years, the FDA, the American Academy of Pediatrics, and the American Pharmacists Association have issued similar guidance and recommendations. Pharmacists can play a big role in making this a reality. When a patient buys an OTC product for a child under 12, make sure that the caregiver knows to use the measuring device included with the product. If one is not included, provide one to the caregiver. Also, make sure the caregiver understands how to use to measuring device properly including how to "measure out" correct amount of medication to be given to the patient. With prescription products, put the directions on the label in milliliters and make sure the patient knows what this means. Also, provide a measuring device with every liquid prescription product, so the patient or caregiver has it when needed and is not tempted to use a household teaspoon. Finally, take every opportunity you can to educate caregivers and health care providers of the potential seriousness of using the word "teaspoon" when dosing liquid medications.

8) Other Resources - To access a user-friendly chart on proper acetaminophen and ibuprofen dosing for children under 12, go to www.getreliefresponsibly.com. This site is published by Johnson & Johnson Consumer Inc., McNeil Consumer Healthcare Division, which is solely responsible for its contents. The site also provides tools to help parents and caregivers choose, use, store, and dispose of over-the-counter (OTC) medications safely. Another great medication safety website for health care providers is the National Council on Patient Information and Education or NCPPIE. This organization is one of the original patient safety coalitions and has been working to advance the safe, appropriate use of medicines through enhanced communication since 1982. They have several programs and educational tools to help promote safe medication use. Their website is www.talkaboutrx.org. Every health care professional should spend some time at this website.

Conclusion

Medication error awareness and prevention requires a total commitment from everyone who works in the pharmacy, management, and ownership. Patient safety should always be at the forefront of any patient care activities any pharmacy staff member undertakes. Remember, it's ok to make patients wait a few extra seconds to ensure every prescription and patient care service is done with the utmost commitment to keeping your patients safe.

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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 the answer sheet.

1) Which of the following are true?

- a) Most medication errors are made by incompetent health care professionals.
- b) A study by Bates et al. found that most errors occur during dispensing.
- c) According to the Institute of Medicine follow-up report "Preventing Medication Errors" medication errors harm about 1.5 million people per year. .
- d) a and b are true
- e) b and c are true

2) Which of the following are true regarding the NCPIE study conducted in 2014?

- a) Sixty two percent of patients were not aware of safety warnings regarding their own medications.
- b) The most frequent source of information on medication risks and warning for patients is their physician.
- c) Twenty eight percent of patients prefer both written and verbal information from a pharmacist.
- d) a and b are true
- e) a, b, and c

3) 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

4) A non-threatening attitude and open communication will improve the chances of success of root cause analysis.

- a) true
- b) false

5) 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 not predictable and you do not know when they are going to occur.
- c) FMEA is sometimes referred to as a risk assessment mechanism.
- d) a and c are true
- e) a, b, and c are true

6) Error traps are used to analyze past medication errors.

- a) true
- b) false

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- 7) When conducting FMEA on a new drug your pharmacy is going to stock in inventory, which of the following questions should be asked?
- a) What clinical information is most relevant about this drug?
 - b) What drugs might the new drug be confused with?
 - c) What are the most important pieces of information that need to be communicated to the patient?
 - d) a and c
 - e) a, b and c
- 8) When conducting FMEA on a new drug your pharmacy is going to stock in inventory, all clinical aspects and nuances must be considered in order to have a comprehensive medication error prevention program in place.
- a) true
 - b) false
- 9) Which of the following abbreviations identified by The Joint Commission should not be used?
- a) “qod” for every other day
 - b) “MS” for morphine sulfate
 - c) “IU” for units
 - d) a and c should not be used
 - e) a, b, and c should not be used
- 10) Which of the following are incorrectly written according to The Joint Commission?
- a) “alprazolam .5mg”
 - b) “amoxicillin 250.0mg
 - c) “Lantus[®] insulin 25 units daily”
 - d) a and b
 - e) b and c
- 11) Which of the following are true?
- a) The “@” symbol should not be used because it can be mistaken for the number 2.
 - b) It is better to use “cc” than “mL” when writing directions for liquid medications.
 - c) The “/” symbol should be used to separate doses or strengths.
 - d) a and b are true
 - e) a, b, and c are true
- 12) 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
- 13) When calling in an oral prescription to the pharmacy, a nurse tells the pharmacist she cannot read the strength on the prescription. She asks the pharmacist how did the patient take it last time? The pharmacist looks up the patient’s profile and finds the strength of medication from the last time it was filled. The nurse tells the pharmacist to give the patient that strength on the new prescription. Is this appropriate?
- a) Yes
 - b) No

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14) Which of the following should pharmacists follow when receiving oral prescriptions?

- a) Pronounce digits separately when reading back a strength or dose to a nurse.
- b) Go to a quiet place in the pharmacy that is free from distractions.
- c) It is appropriate to abbreviate a drug name when taking an oral prescription or order over the phone to save time.
- d) a and b
- e) a, b and c

15) A physician asks a pharmacist to calculate a dose of immediate release morphine 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

16) Pharmacists should check the label against the prescription at least _____ time(s).

- a) one
- b) two
- c) three
- d) ten

17) 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”

18) Which of the following are tips for pharmacists to help reduce medication errors?

- 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

19) Which of the following are tips for pharmacists to help reduce medication errors?

- a) It is better not to create break periods for pharmacists. It disrupts workflow and increases medication errors.
- b) Train technicians and interns to be the one to answer the phone.
- c) Pharmacists should conform to the technician’s work flow.
- d) a and b
- e) a, b and c

20) Which of the following are errors that e-prescribing systems have the potential to cause?

- a) Errors when e-prescribing systems are not kept up-to-date.
- b) Errors when physicians use short-codes for medication directions.
- c) Errors when the prescriber forgets to close one patient’s record on the system before e-prescribing for the next patient.
- d) b and c
- e) a, b, and c

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21) Which of the following are facts about medication errors in practice?

- a) Automation can create new types and classes of medication errors.
- b) Bar codes don't prevent all medication errors.
- c) Medication errors usually occur due to a breakdown in the medication use process.
- d) a and b
- e) a, b and c

22) It is estimated that the average number of steps in the medication use process is _____.

- a) 10
- b) 25
- c) 40
- d) 50
- e) 100

23) Which of the following are true regarding oral syringes?

- a) Do not stock patient care areas with oral syringes. Make the nursing staff call the pharmacy department for one.
- b) Use auxiliary labels on oral syringes that clearly state "For Oral Use Only".
- c) Dispense liquid medications from the pharmacy in oral syringes whenever possible.
- d) b and c
- e) a, b and c

24) Which of the following are tips for pharmacists to help reduce medication errors?

- a) Medication bottles should be stored with at least 0.5 inch between them on the shelf.
- b) Keep the fax machine near the final verification area in the pharmacy so it's convenient for the pharmacist to access.
- c) Make sure the lighting in the pharmacy does not cast a glare on computer screens.
- d) a and b
- e) a, b and c

25) Pharmacist should train their technicians and interns never to interrupt a pharmacist during the final verification before dispensing.

- a) true
- b) false

26) What questions should a physician ask when choosing an e-prescribing system?

- a) What is the number of prescribers/organizations using the system?
- b) What type of testing has been done on the system?
- c) Can the system interface with pharmacy computers?
- d) b and c
- e) a, b and c

27) A pharmacist receives a prescription for amoxicillin 400mg/5mL. The directions on the prescription are "one teaspoon every 12 hours.". Should the pharmacist use the word "teaspoon" in the directions on the label.

- a) Yes
- b) No

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28) Pharmacies should develop a list of medications or processes that should involve the independent double check system.

- a) true
- b) false

29) Which of the following are tips for pharmacists to help reduce medication errors?

- a) Create a formal process in your pharmacy to document and evaluate medication errors or “near misses”.
- b) Area for final verification should be in high traffic areas to facilitate patient interaction.
- c) Use the same process or workflow every time you check a prescription.
- d) a and c
- e) a, b and c

30) Which of the following are labeling suggestions?

- a) The minimum font should be 10 point font.
- b) Use a colored background, such as yellow, for all labels.
- c) Use typographic cues (bolding and highlighting) for patient content only.
- d) a and b
- e) a, b and c

Continuing Education Test Answer Sheet

Preventing Medication Errors in Pharmacy Practice for New York Pharmacists

New York Course #: 071067-17-001-H05
Release date: 01/07/2017

C.E.U.s: 0.3
Expiration date: 01/07/2020

Contact Hours: 3 hours

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|---------------|---------------|---------------|
| 1) A B C D E | 11) A B C D E | 21) A B C D E |
| 2) A B C D E | 12) A B C D E | 22) A B C D E |
| 3) A B C D E | 13) A B C D E | 23) A B C D E |
| 4) A B C D E | 14) A B C D E | 24) A B C D E |
| 5) A B C D E | 15) A B C D E | 25) A B C D E |
| 6) A B C D E | 16) A B C D E | 26) A B C D E |
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| 8) A B C D E | 18) A B C D E | 28) A B C D E |
| 9) A B C D E | 19) A B C D E | 29) A B C D E |
| 10) A B C D E | 20) A B C D E | 30) A B C D E |

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Program Evaluation:

Did this program meet its objectives?
1 2 3 4 5 (1 = poor and 5 = excellent)

Please rate the content of this program
1 2 3 4 5 (1 = poor and 5 = excellent)

Please rate the applicability to my practice
1 2 3 4 5 (1 = low and 5 = high)

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