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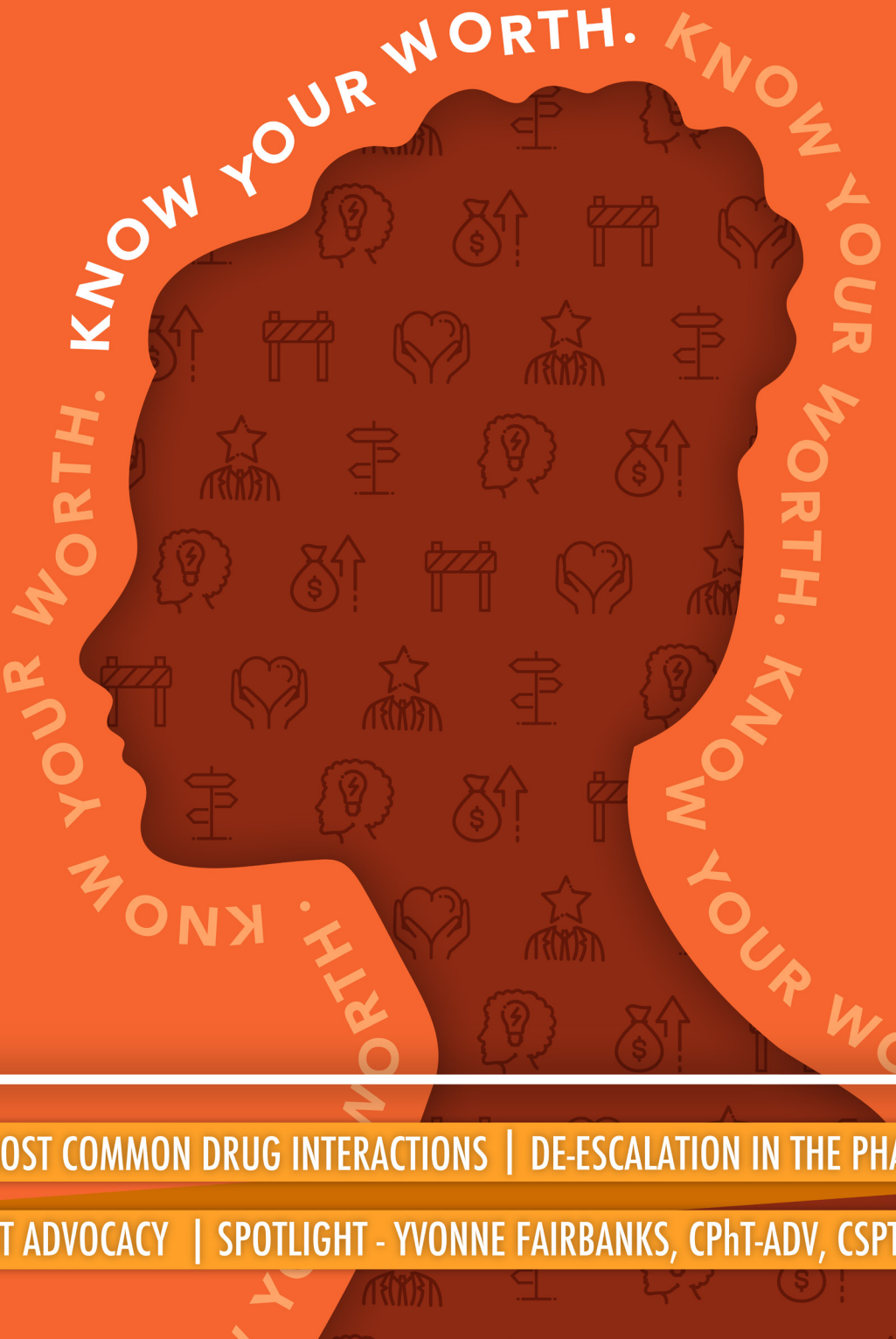
CPhT CONNECT™

THE MAGAZINE FOR PHARMACY TECHNICIANS



CE - MOST COMMON DRUG INTERACTIONS | DE-ESCALATION IN THE PHARMACY

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Mike Johnston,
CPhT-Adv, BCSCPT, BCNCPT

Creative Director
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Director of Education
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Manager, Continuing Education
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Member Services
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Mariana Ruiz
Precious Fazon

CONTRIBUTORS
Amanda DeMarzo,
PharmD, MBA, PACS
HeatherLyn Gray, MPH, CEM, CPhT
Robin Luke, CPhT
Max May
Cassi Prosper, CPhT
Lauren Turner, CPhT, B.S
Jim Mizner, MBA, BS in Pharmacy, RPh

and the Editorial Advisory Board

CPhT CONNECT
PO BOX 683148
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PUBLISHER'S NOTE

mike@pharmacytechnician.org

Mike Johnston,
CPhT-Adv, BCNCPT, BCSCPT
Founder & CEO, NPTA

One of the most powerful moments for me over the past year was when I delivered a keynote address at CPhT LIVE and shared my thoughts on something deeply personal and universally impactful: knowing one's worth. Not just in terms of dollars and cents, but in the contribution, dedication, and value that we, as pharmacy technicians, bring to the table every single day.

As I revisit that talk, I'm reminded of the countless stories I've heard from pharmacy technicians across the country. Tales of individuals going above and beyond, of late nights and early mornings, of those moments when a patient's grateful smile said more than words ever could. Yet, so often, there's a hesitancy, a pause when it comes to recognizing and asserting the true value of our profession.

That's where the real challenge lies.

In this issue, I'm thrilled to present our cover story, aptly titled "Know Your Worth." Drawing from that very presentation, we delve deeper into this topic and hope to spark a conversation that's long overdue. It's a reflection, a guide, and a rallying cry all in one.

Why is this so vital? Because when we truly know our worth, not only do we elevate our professional lives, but we also enrich the care we offer to patients. We negotiate better, advocate for ourselves more confidently, and lay down paths for those following in our footsteps.

I urge each one of you to dive into this piece, reflect on your journey, and take a moment to acknowledge the immense value you bring to this profession.

Mike Johnston,
CPhT-Adv, BCNCPT, BCSCPT
Founder & CEO, NPTA

Nunquam non paratus.
Never unprepared.

NEWS BRIEFS

U.S. WARNS MEXICAN PHARMACIES SELL FENTANYL AND METH-LACED PILLS

Keeping track of where medications come from Keeping track of where medications come from legally is a tough enough job for those who have the responsibility. From purchaser to distributor to dispenser and everyone else along the way, many people on the path to end users can identify irregularities in the medications obtained from nearly any source. The color may be off, or there is an unfamiliar smell or some other physical trait that makes one pause and verify the substance as what the product is proposed to be.

For the most part, one can google 'pill identification' online or call the pharmacy where the medications were dispensed to speak to a pharmacist and find out if the medication in the bottle is actually what is listed on the label. Many labels now also have identifying information on them, such as small yellow tablets with numbers and other markings to help people who match this information to the product inside the bottle.

What is more challenging to identify are medications that may have been purchased in other countries, such as Mexico. Thousands of Americans purchase medications from Mexico through the Internet or in person each year. As drug costs soar, leaving many people unable to afford medications or the necessary visits to obtain the prescriptions, more and more Americans are crossing the border into countries such as Mexico and purchasing these same drugs without a prescription. One does not have to travel far, either. Small towns near the U.S.A/Mexico border are often crowded with tourists who may be making a stop while on vacation or there to buy needed medications.

Here in the United States, there is a growing problem with street drugs laced with fentanyl. Drug overdose deaths reported by the end of 2021 grew to 70,601 due to synthetic opioids, mainly fentanyl. And the numbers only increase where fentanyl is now regarded as the single deadliest drug threat to our nation, involving more deaths of Americans under 50 years of age than any other cause of death.

A few short months ago, the FDA again sent out a warning for counterfeit drugs from Mexico, and just recently, 71% of 17 pills tested in an L.A. Times investigation of drugs from pharmacies in Mexico have been found to be laced with fentanyl, heroin, and methamphetamines. A UCLA study shows evidence that pills sold without a prescription, such as oxycodone, Percocet, and Adderall, are primarily sold to American tourists. Forty pharmacies were included in the study, showing that 11 stores sold counterfeit pills laced with these dangerous ingredients, and 68% sold controlled substances without a prescription.

The U.S. States Department has issued a warning about counterfeit pills sold in these Mexican pharmacies and also adds that it can be difficult to distinguish any counterfeit characteristics just by observation alone.

PAXLOVID FOR COVID-19 IS NOW FDA APPROVED

Global statistics show that nearly 691 million people were impacted by COVID-19, with over 6.5 million cases resulting in death. In the United States, over 107 million total cases occurred, and Americans took drastic measures to stay safe. Lockdowns, masks, and social distancing became part of the normal way of life as we slowly watched things try to get back to the way they were before the pandemic. Fear was still prevalent through it all. Never-ending calls for a vaccine overwhelming hijacked the news, and people hung on to every report hoping to hear that something was coming to end the chaos. During this time, the first vaccine did come about, the Pfizer BioNTech COVID-19 vaccine and others soon followed. This brought new terminology that many people had never heard of before. Emergency Use Authorization (EUA) meant the product was not approved like many drugs. Instead, it went through a different process to receive approval more rapidly based on a nation's public health protection against chemical, biological, radiological, and nuclear (CBRN) threats. Many COVID-19 treatments were approved in this manner as time was of the essence, and a pandemic was on hand.

Many health professionals understand the difference between the EUA and the typical FDA approval. While the EUA goes through rigorous processes such as illustrating safety and effectiveness, products issued under the EUA are FDA-authorized based on a reasonable belief that this product is effective based on the best evidence available at the time. All the information may not be available at the time, but the benefits outweigh the risks to the general public. This was just one topic of disagreement among many who decided whether to be vaccinated when a vaccine became available.

During this time, other COVID treatments came out, all under EUA, each for a specific population and circumstance. One such medication, a tablet known as Paxlovid, showed great promise as people were prescribed this upon COVID infection to help prevent hospitalization or death. While there were so many treatments coming out at that time, all claiming to be the first of its kind, this nirmatrelvir and ritonavir combination was the first oral antiviral treatment for COVID-19 that has recently been approved by the FDA and no longer remains in a EUA status.

To date, more than 11.6 million courses of Paxlovid have been prescribed in the United States. Trials such as the Phase 2/3 EPIC-HR study and the Phase 2/3 EPIC-SR showed a significant reduction in hospitalization or death from any cause when patients were treated with Paxlovid within five days of COVID symptoms. These studies confirmed earlier data that showed like results. Other research and studies continue to support this conclusion. According to Pfizer, Americans eligible for Paxlovid will continue to receive the medication at no charge, and the U.S. government will still oversee distribution. Out-of-pocket costs may vary according to coverage for insured patients.

BREXPIPRAZOLE APPROVED FOR DEMENTIA RELATED TO ALZHEIMER'S

More than 6.7 million people over the age of 65 are estimated to have Alzheimer's in the United States alone. While these statistics also show that the average survival rate with this disease post-diagnosis is four to eight years, some live up to 20 years with the disease. The older the person, the higher the risk of getting Alzheimer's. The first treatment of its kind has been given FDA supplemental approval for agitation associated with dementia due to Alzheimer's disease. Many people confuse the two terms, but Alzheimer's disease is a specific disease, and dementia is a general term for a group of like diseases of which Alzheimer's The difference between Alzheimer's disease and other dementias | Alzheimer Society of Canada is just one example. Agitation is one of the most common symptoms of patients with dementia due to Alzheimer's. It can be extremely challenging for caregivers to manage. Brexpiprazole has shown clinically significant improvement in these patients at 2mg or 3mg dosages after 12 weeks in regard to agitative behaviors as a result of dementia in Alzheimer's patients. The recommended dose to start treatment of Brexpiprazole is 0.5mg once a day for one week, with increasing dosages of 1mg daily during week 2 and 2mg starting on day 15. Dosage strengths available will be for 0.25mg, 0.5mg, 1mg, 2mg, 3mg, and 4mg tablets.

Common reactions included headache, dizziness, urinary tract infection, insomnia, and nasopharyngitis. A boxed warning will be included with the brexpiprazole medication class stating an increase in the risk of death in older adults with dementia-related psychosis who are treated with antipsychotic drugs. Brexpiprazole was previously approved in 2015 for schizophrenia and adjunctive treatment for depressive disorder.

NEW TREATMENT TO PREVENT C. DIFF RECURRENCE

Statistics show that nearly 500,000 people in the United States are affected by Clostridium difficile infections (CDI). This leading cause of antibiotic and healthcare-associated infective diarrhea also results in approximately 30,000 deaths annually. The burden of CDI in the United States: a multifactorial challenge | BMC Infectious Diseases | Full Text (biomedcentral.com). C. diff and C. diff recurrences are an 'urgent threat' as identified by the CDC. Recurrent C. difficile infections (CDI) are said to be at about 35% to as much as 60% of cases.

You may think of nursing homes or hospitals when you think of C. diff as that is where the most cases occur because these are known to be where germs spread easily, and antibiotic use is common. Antibiotics and isolation with contact precautions are the typical first-line treatments. Now there is a new treatment option recently approved by the FDA.

The first and only fecal microbiota, taken orally, is indicated to prevent recurrent Clostridioides difficile infection (rCDI) in people 18 years of age and older, following antibacterial treatment for rCDI. Vowst, manufactured from human fecal matter from qualified donors, is a bacterial spore suspension in a capsule. Each capsule comprises between 1×106 and 3×107 Firmicutes spore colony-forming units in 92 ± 4% (w/w) glycerol in saline. Dosing is 4 Vowst capsules orally once a day for three consecutive days, taken on an empty stomach before the first meal of the day. Capsules should be swallowed whole and are not to be crushed or chewed. A laxative is given the day before, at least eight hours before the first Vowst dose, and very little water is allowed during this eight-hour period.

Common side effects reported in clinical trials include abdominal bloating, fatigue, constipation, chills, and diarrhea. Warnings include potential food allergens and transmissible infectious agents due to human fecal matter.

Vowst can be stored in original packaging with child-resistant caps between 36 to 77°F, 2 to 25°C. It can be stored in the refrigerator but not in the freezer. Each Vowst bottle has twelve white capsules with "SER109" imprinted on each capsule. As with all medications, it is kept out of reach of children.

OTC TOPICAL FOR ED APPROVED

More and more prescription medications are making their way to OTC status, and many more are under consideration. For example, Narcan spray has recently been approved for over-the-counter purchase, and many community health centers even offer it for free. Since Roe vs. Wade was overturned, the critical need for accessible contraceptive care has led many states to consider OTC oral contraceptives. Even an FDA advisory committee overwhelmingly supports an OTC oral contraceptive.

While these and other medications make it through the FDA process of OTC consideration, recently, Eroxon, a topical gel, has been approved for erectile dysfunction (ED) treatment and will be available over-the-counter. The OTC gel is already available in a few European countries in Europe https://www.globaldata.com/company-profile/futura-medical-plc/.

The mode of action for the topical gel Eroxon has been shown to work faster than oral ED treatments such as Viagra and Cialis. Trials show a time of ten minutes or less with the gel, compared to the 30 –60 minutes stated for the oral ER medications.

The mechanism of action https://www.medical-device-network.com/news/fda-greenlights-first-otc-topical-gel-for-erectile-dysfunction/ is said to involve stimulating nerve sensors with a cooling and recovery warming effect. More than 60% of trial patients experienced a clinically meaningful effect in a phase 3 trial. In Europe, the price is around $31 for a four-pack or Eroxon. In the U.S., there is no timeframe for when Eroxon will be available to market according to manufacturer Futura Medical, and no price has been set.

DEA CRACKS DOWN ON PHARMACY RED FLAGS

So many pharmacies have been sued for their alleged involvement in what can be called the ongoing opioid crisis. What many may regard as the first signs of awareness of the crisis's seriousness could have been the suit against Purdue Pharma and the Sackler Family. A suit that was resolved in 2020 with an agreement to settle for more than $8 billion and dissolve, accompany, and repurpose its assets entirely for the public benefit. Soon followed was the barrage of individual cases and the focus on pharmacy's role in this scene.

Each month it seems, we read about another group of pharmacies or a particular state that has sued pharmacy and won multi-million- and billion-dollar settlements for dispensing opioids. While the pharmacy does not manufacture nor prescribe these controlled substances, the cases involve pharmacist liability with these prescriptions. As many debates have taken place as to who is most or solely responsible for educating patients about opioid use, and potential abuse, the piece focused on most of the pharmacy's lack of oversight and what the attorneys argue is the negligence in noticing obvious 'red flags.' The arguments heat up as one side argues pharmacy does indeed scrutinize prescriptions in accordance with all regulations and act on those prescriptions that are deemed out of appropriate bounds, but also are held to prescriber insistence when justifications are documented. As many of these cases continue on in the courts today, pharmacies have taken steps, as well as prescribers and are now under a multitude of new regulations that work to prevent further issues with opioid prescribing and dispensing. In light of these issues, pharmacies have become more aware of such issues in prescribing opioids, such as defining more accurately the term 'red flag.' A pharmacist is already responsible for identifying any abuse or diversion of controlled substance prescriptions and documenting all actions taken and resolutions. But other factors exist that make the matter not so black and white. For example, a pharmacy located near a cancer center would most likely dispense more pain-type medications than one located in an infectious disease clinic. But many pharmacies are being investigated for the 'unusual number of controlled substance prescriptions dispensed,' and pharmacies are not clear on what to do when they are doing nothing wrong. The DEA has recently announced that given enough cause; they will inspect pharmacies that fail to recognize and address controlled substance prescriptions that raise 'red flags.' The term 'red flag' does not appear in numerous regulations such as the Controlled Substance Act, DEA Pharmacist Manual, or DEA Regulations, but it is often used in cases against pharmacies to show negligence. Pharmacists must now be even more aware of issues such as dispensing medication combinations that can cause overdose or death, pain dosages and length of treatments, and price gouging. With proper training and education, certified pharmacy technicians also assist in this ever-changing, highly scrutinized process. Together, pharmacists and certified pharmacy technicians can work toward the safety of both the public and each other while complying with all regulations.

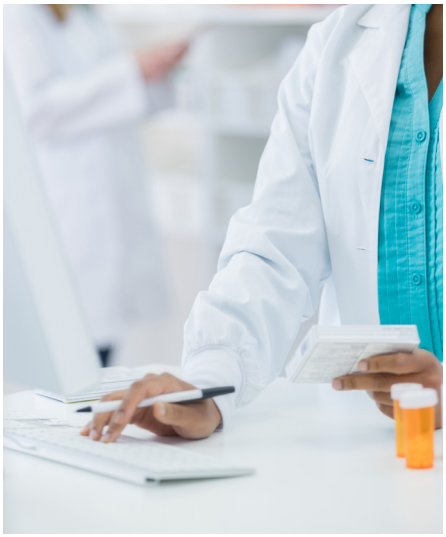
CBD COULD ASSIST NALOXONE IN REVERSING OPIOID OVERDOSE

Thanks to an aggressive campaign bringing awareness to the public about opioid overdose, naloxone is known to many as the lifesaving drug that can reverse an overdose from opioids such as heroin, fentanyl, and other prescription opioid medications. Naloxone does not, however, work on non-opioid drugs such as cocaine, benzodiazepines, or alcohol. As of 2022, naloxone is available without a prescription, even as state laws slightly differ in offering over-the-counter availability or through a standing order between pharmacists and healthcare providers. Over the last couple of years, there have been a few ways that people have fought for and gained better access to naloxone, which requires rapid action to administer, and begin blocking the effect of opioids. For example, restoring breathing within two to three minutes for someone whose breathing has slowed down. Narcan (naloxone) nasal spray was FDA-approved in 2015, previously only available as an injection. More recently, naloxone nasal spray has been approved for over-the-counter distribution as it is easy to administer and has no potential for abuse. Many providers also co-prescribed this medication along with any opioid prescriptions as a precaution and/or in accordance with the law. While naloxone nasal spray continues to save lives, evidence shows that standard doses of the drug may not be sufficient enough to reverse the overdose effects of the more powerful forms of synthetic fentanyl now becoming more common on the streets of America. While nearly 80% of overdose cases today are now due to fentanyl compounds, researchers are seeking alternative solutions to help counter these rising statistics. One such study points to cannabidiol, also known as CBD, as potentially beneficial in reversing opioid overdose when used in conjunction with naloxone. Michael VanNieuwenhze, Ph.D., and co-principal investigator for the project, Alex Straiker, Ph.D., and senior research scientist at Indiana University Bloomington, presented a study illustrating that a novel noncompeting pharmacological strategy works as well as or better than naloxone against fentanyl.

Prior research in 2006 by a group based in Germany showed that CBD interfered with opioid binding indirectly and, when used with naloxone, accelerated the beneficial effects of naloxone. Researchers emphasize more study needs to be done as the goal is to find a new therapeutic that saves lives and results from marijuana-derived compounds, and naloxone has shown promise.

USP COMPLIANCE PREPARATION WITH EXCEL SPREADSHEET

Revised U.S. Pharmacopeia (USP) standards will soon be effective in just over five months on January 1, 2024. The USP practice standards on sterile compounding and safe handling have added some things that have never before been included but are possibly recommended. This time around, some changes that may need to be implemented include identifying a designated person with specific responsibilities, such as ensuring certain requirements are met, new staff requalification requirements and the frequency of personnel requalification, and a move to monthly surface sampling.



While the Joint Commission that accredits U.S. healthcare organizations and programs update their new survey and new USP requirements, healthcare entities will scramble during the months-long process of evaluating their current standards and creating a process to meet the deadline of January 1st.

One such suggestion is to develop a gap analysis program. One can take advantage of the resources offered by experts such as the Joint Commission or create their program like one such facility, Massachusetts General Hospital in Boston, has done. Paul Baker, Pharm D, NCSCP, compounding compliance coordinator at the hospital, shares the advantages and other considerations of developing a gap analysis program using an Excel spreadsheet during the process. Starting with an Excel spreadsheet can help one not only begin the process but stay organized and focused on the project throughout.

It is important to take inventory of where your facility stands on current USP standards and how they compare to the updated standards to begin in just over five months to determine what work needs to be done. Going through the applicable USP Chapter line-by-line and placing information into the spreadsheet is only the beginning. One then should indicate if these requirements have been met or need to be met. One way the Boston hospital used was a simple yes, no, partially, or not applicable. Include necessary improvements, the need to develop a workflow, and any practices in place that are not listed.

For best practices that are already above and beyond those being recommended, remember the USP standards are a minimum benchmark. You may not need to adjust anything regarding this particular process you already have in place.

While most places now do not necessarily have a 'designated person' who has the responsibility of ensuring that appropriate air classification requirements are met, corrective actions are documented and taken if problems are identified, and formal, written quality assurance and control programs are established according to the new standards; most sites have a manage that these types of responsibilities fall under. New standards that this person now be identified in a compounding facility.

The personnel requalification applies to those who actually compound changes to every six months for some, where it may have been annually. Other requalifications have some flexibility that factors into their involvement in the process, according to a chart found in the USP <797?> document. Also included is a change to the monthly surface sampling.

Experts stress a comprehensive gap analysis program, open communication with staff, and thorough review with various peers to ensure a sound process.

THE FUTURE OF RFID AND PHARMACY

We are in a time in history when it seems more medications are in short supply. Some just accept that it could be months before something becomes available again. It used to be that a shortage of almost any medication could be replenished within a reasonable amount of time, and the date of availability would often be accurate. Now it seems there are just too many factors.

Manufacturer issues may include more than unavailability of an ingredient or quality control problems but add in staffing, lockdowns, inadequately trained staff, lack of alternate resources, and this compounds into a shortage with no easy answer. Seeing the acronym TBA (to be announced) has now become such commonplace on drug shortage lists that it is now being deciphered as 'I don't know.'

In addition to this unknown information, it is important for many pharmacies and other healthcare facilities to know where the stock inventory is located in case some can be redistributed. Thus radio-frequency identification technology (RFID) was identified as a beneficial way to accomplish this. First used in the pharmacy industry by Pfizer in the early 2000s, some wonder why we do not see more of this technology today. Experts stress the importance of healthcare systems incorporating this technology for patient safety.

Pharmacy is no stranger to technology; it can be found in every aspect of pharmacy, but RFID has been slow to implement. RFID technology could help with reviewing inventory content within systems, managing hazardous medications, alerting when stock is low, maintaining realistic inventory numbers, and so much more. Although this technology has grown over the last few decades, it has been inconsistent.

Problems identified that need to be considered include:

Quality Assurance – Antennas and ships are very small. Any variation can impact stability. And there is not one size fits all. The gold standard for quality certification in the RFID industry is the widely used ARC RFID Lab at Auburn University.

Data Standards, the Cloud – Meant to support patient safety and provide RFID-enabled medication data stored in the Cloud. Offloading data to the Cloud allows for unlimited information to be available at any given time. Opt-in accessibility, real-time analytics, improved data accuracy, capabilities across multiple stockholders, and enhanced data security are some of the major benefits of the Cloud.

While at one time, RFID did not appear ready to go and was awash with problems, the development of standardized quality metrics, application-specific performance specifications, and the advent of cloud-based data systems now means that quality can be more achievable. So, while we see RFID use grow, end users are encouraged to embrace and learn more about the many ways this technology can help keep patients safe, what is needed to implement this into your workspace, and improve pharmacy areas such as inventory.

TYPE 1 DIABETES
DISEASE BRIEF

BY CASSIE PROSPER, CPhT

What Is Type 1 Diabetes?

Diabetes is a metabolic disorder in which the body has high blood glucose (or sugar) levels for prolonged periods. Blood glucose is your primary source of energy and comes mainly from the food we eat. Insulin is a hormone made by the pancreas that helps the glucose in your blood get into your cells to be used for energy. Another hormone, glucagon, works with insulin to control blood glucose levels.

Type 1 diabetes (T1D), also called insulin-dependent or juvenile diabetes, usually develops in children, teens, and young adults but can present at any age. According to the Mayo Clinic, T1D tends to appear at two noticeable peaks. The first peak occurs in children between 4 and 7 years old. The second is in children between 10 and 14 years old.

Although the exact cause of T1D is still unknown, experts think the leading causes are genetics and environmental factors, such as viruses, that might trigger the disease, and studies are ongoing. Researchers have determined that in patients with T1D, the body's own immune system destroys the insulin-producing islet cells in the pancreas. Insulin is a hormone created by the pancreas, a small gland behind and below the stomach. Insulin travels through the body, allowing sugar (or glucose) to enter the cells. Once many islet cells are destroyed, the body will produce little or no insulin. As a result, there's no insulin to let glucose into the cells, and because of this, sugar builds up in the bloodstream, which can cause life-threatening complications. Over time, type 1 diabetes complications can affect major organs in the body. These organs include the heart, blood vessels, nerves, eyes, and kidneys. Maintaining an average blood sugar level can lower the risk of many complications.

What Are The Signs And Symptoms?

T1D symptoms can develop in just a few weeks or months. Once symptoms appear, they can be severe. Symptoms can include increased thirst, urination, hunger, blurred vision, fatigue, and unexplained weight loss.

Sometimes the first symptoms of T1D are signs of a life-threatening condition called diabetic ketoacidosis (DKA). Symptoms of diabetic ketoacidosis include: fruity-smelling breath, dry or flushed skin, nausea or vomiting, stomach pain, trouble breathing, and difficulty paying attention or feeling confused. DKA occurs when the signal from insulin in the body is so low that the body starts breaking down fat too quickly. The liver processes the fat into a fuel called ketones, which causes the blood to become acidic.

DKA or untreated diabetes can lead to serious, even fatal, health problems. If you think you could have T1D, see your doctor to get your blood sugar tested. If you or your child have symptoms of DKA, contact your healthcare professional right away, or go to the nearest hospital emergency room.

How Is Type 1 Diabetes Diagnosed?

Diagnosing T1D often begins with a random plasma glucose (RPG) test. This blood test measures your blood glucose level at a single point in time. Sometimes health professionals also use the A1C blood test to determine how long someone has had high blood glucose.

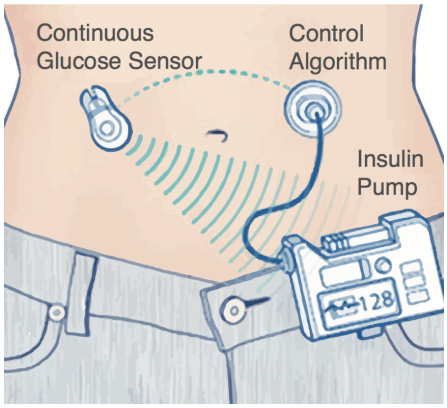
Even though these tests can confirm that you have diabetes, they can't identify what type you have. To determine if your diabetes is type 1, your healthcare professional may test your blood for specific autoantibodies. Autoantibodies are antibodies that mistakenly attack your healthy tissues and cells. The presence of certain types of autoantibodies is common in type 1 but not in type 2 diabetes.

TrialNet, an international research network, also offers autoantibody testing to family members of people diagnosed with the disease. The presence of autoantibodies, even without diabetes symptoms, means the family member is more likely to develop T1D.

What Are The Treatment Options?

If you have T1D, you will need to take insulin shots (or wear an insulin pump) every day because your body no longer makes this hormone. Insulin is required to manage your blood sugar levels and give your body energy. Insulin may be administered using a needle, syringe, insulin pen, or insulin pump. If insulin doses aren't correlated to your food intake and physical activity, it may result in hypoglycemia (low blood sugar) or hyperglycemia (high blood sugar), both of which can be dangerous.

The National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) has been essential in developing "artificial pancreas" technology. An artificial pancreas replaces manual blood glucose testing and insulin shots. This single system monitors blood glucose levels around the clock and automatically provides insulin or a combination of insulin and glucagon. In 2016, the U.S. Food and Drug Administration approved a type of artificial pancreas system called a hybrid closed-loop system. This system tests your glucose level every 5 minutes throughout the day and night through a continuous glucose monitor. It automatically gives you the right amount of long-acting basal insulin through a separate insulin pump.



NIDDK is also supporting research into pancreatic islet transplantation. This experimental treatment is for hard-to-control T1D. A pancreatic islet transplant replaces destroyed pancreatic islets with new ones that make and release insulin. This procedure takes islets from the pancreas of an organ donor and transfers them to a person with T1D. Pancreatic islet transplantation is still in the study and research phase and is only available to those within the studies. Although there is no cure for T1D, it can be successfully managed through blood sugar monitoring and proper diet and exercise. Additionally, partnering with the appropriate team of providers, such as an endocrinologist, podiatrist, ophthalmologist, diabetes educator, or dietician, is crucial in preventing the many health problems associated with Type 1 diabetes. The American Diabetes Association provides many great resources and tools on their website (https://diabetes.org). Managing diabetes can be challenging, but stay positive because your health is worth it!

TYPE 2 DIABETES
DISEASE BRIEF

BY LAUREN TURNER, CPhT

Diabetes mellitus is a group of life-threatening chronic illnesses that affect 37.3 million people (or 11.3%) of the United States population, according to the Centers for Disease Control (CDC). It is a chronic illness that affects how glucose, or blood sugar, is used in the body and how the body turns food into energy. Diabetes is a severe health condition. It has three main types: Type 1, Type 2, and gestational diabetes. Prediabetes is also considered to be part of the Diabetes mellitus condition and is regarded as a serious health condition as well. Approximately 96 million American adults have prediabetes, which is more than 1 in 3, and 80% do not know they have it. Prediabetes can be delayed or reversed to prevent progression to Type 2 diabetes if particular lifestyle and diet changes are implemented.

Diabetes is a disease in which your body either makes too much insulin or cannot use the insulin your body has produced as well as it should. When a person eats, the body breaks down the food into its building blocks, sugar, specifically glucose, which is then released into the bloodstream. In response to this increased blood glucose level, insulin is released from the pancreas, stimulating glucose uptake into the body's cells responsible for brain function, muscles, and tissues. When the body doesn't make enough insulin or the cells are no longer stimulated by insulin, too much blood sugar remains in the bloodstream and can build up, causing heart problems, kidney disease, and even vision loss (CDC, 2022).

Type 1 diabetes is characterized by the pancreas being unable to produce insulin. The exact cause of why this occurs is unknown, but it is thought to be an autoimmune disorder where the body attacks itself erroneously. Type 1 diabetes was previously called "juvenile diabetes" or "insulin-dependent diabetes" because it is mainly diagnosed in children, teens, and young adults. For those with Type 1 diabetes, insulin must be given daily to survive. The symptoms of Type 1 diabetes tend to onset quickly and be more severe than in Type 2 diabetes. The symptoms include feeling very thirsty, urinating often, feeling tired and weak, blurry vision, numerous infections of the mouth, gum, or vaginal areas, losing weight without trying, and irritability. There is no known cure for Type 1 diabetes, and it is essential to see a doctor if you have any of these symptoms. The treatment for Type 1 diabetes includes insulin replacement medications such as Humalog®, Lantus®, Novolog®, and insulin lispro.

Type 2 diabetes is characterized by your body being unable to use insulin well, which causes blood sugar levels to be abnormal and build up in the bloodstream. With Type 2 diabetes, you may or may not notice any symptoms. It may develop over many years and is usually diagnosed in adults. Long-term complications arise from diabetes, such as cardiovascular disease, nerve damage, kidney damage, eye damage, and blood flow restriction to the feet. This restriction of blood flow can cause people with diabetes to have to undergo amputations because of the lack of blood flow to the extremities. As with prediabetes, Type 2 diabetes may be prevented or reversed with changes to diet, increased exercise, reducing stress, and losing weight. Treatments for Type-2 diabetes, like Metformin, work by lowering the glucose absorbed from the intestines decreasing how much glucose is made in the liver, and improving insulin sensitivity (Puckey, 2022).

Pregnant women who develop diabetes only during pregnancy have Gestational diabetes. It usually resolves after giving birth, but the baby could be born at higher risk for health problems like premature birth, heavy birth weight, and low blood sugar. Having gestational diabetes also increases your risk for preeclampsia, a dangerous high-blood pressure pregnancy disease, and an increased risk of developing type 2 diabetes later in life. There may or may not be symptoms observed with gestational diabetes. The most common symptoms include excessive thirst, sweating, and frequent urination, mostly seen as the pregnancy progresses. Gestational diabetes can be managed with a nutritious diet and exercise. Medication may be prescribed if blood sugar levels are uncontrollable with the former recommendations. Insulin injections are the most common treatment; however, recently, oral medications deemed safe to use during pregnancy (i.e., Metformin) have been prescribed as well.

As we have seen, diabetes is a severe disease that should be paid close attention to. According to the CDC, diabetes is the seventh leading cause of death in the United States, the number one cause of kidney failure, lower-limb amputations, and adult blindness, and the number of adults diagnosed with diabetes has more than doubled in the last 20 years. It is essential to check in with your healthcare provider to be tested for diabetes and prediabetes so that treatment can be started immediately if diagnosed. There is light at the end of the tunnel. By becoming more active, exercising 150 minutes a week, and choosing healthy and nutritious food, you can take a significant step toward preventing diabetes.

HIV/AIDS
DISEASE BRIEF

BY: HEATHERLYN GRAY, MPH, CEM, CPhT

On June 5, 1981, the CDC Morbidity and Mortality Weekly Report (MMWR) presented case reports on 5 patients in Los Angeles who were treated for Pneumocystis pneumonia, a condition that, in the United States, is almost exclusively limited to severely immunosuppressed individuals. What made these case reports stand out is that the 5 patients had been previously healthy without clinically apparent underlying immunodeficiencies. This report would be the first official reporting of what would be known as the AIDS epidemic.

Acquired Immunodeficiency Syndrome (AIDS) is the most severe stage of Human Immunodeficiency Virus (HIV) infection. HIV attacks the immune system, specifically damaging or destroying CD4 cells (also called T cells or helper cells) which are responsible for protecting us from common diseases and infections.

As the infection progresses, so does the effects on the immune system, progressively weakening it leaving the individual immunocompromised and at risk for serious illnesses and infections.

Transmission & Prevention

HIV can be transmitted by sexual contact, sharing needles to inject drugs, and during pregnancy, birth, or breast/chestfeeding. HIV prevention strategies that reduce transmission potential include abstinence, never sharing needles, and using condoms the right way during every sexual encounter. For those at risk for HIV, pre-exposure prophylaxis (PrEP) can reduce the chance of getting HIV from sex by about 99% or at least 74% for injection drug use when taken as prescribed. There are three medications currently approved for use as PrEP:

- Truvada (emtricitabine 200mg/tenofovir disoproxil fumarate 300mg tablet)
- Descovy (emtricitabine 200mg/tenofovir alafenamide 25mg tablet)
- Apretude (cabotegravir 200mg/mL extended-release injectable suspension)

Disease Progression

Without treatment, HIV infection typically progresses through three stages:

- Stage 1: Acute HIV Infection – People in this stage have a large amount of virus in their blood and are very contagious. Early symptoms of HIV infection are flu-like (e.g., sore throat, fever, swollen lymph nodes, chills, fatigue) and may appear within 2 to 4 weeks after infection.
- Stage 2: Chronic HIV Infection – Also called asymptomatic HIV infection or clinical latency, this stage is characterized by an absence of symptoms and may last a decade or longer. During this time, the virus is still active and replicating, and people in this stage are still able to transmit HIV.
- Stage 3: AIDS – The most severe stage of HIV infection. People in this stage have badly damaged immune systems and are at higher risk for opportunistic infections or other serious illnesses.

Diagnostic Testing

As of 2019, 13% of individuals with HIV are unaware they are infected. Since the early symptoms of HIV infection can resemble other viral infections – and the fact that some people infected with HIV have no symptoms at all – testing is required to confirm HIV. HIV can be diagnosed through blood or saliva testing, including:

- Antigen/antibody tests, which usually involve drawing blood to detect antigens on the HIV virus or antibodies produced by the immune system. Due to the time required for antigens and antibodies to be detectable, these combination tests can take 2-6 weeks after exposure to become positive.
- Antibody tests, which detect antibodies to HIV in blood or saliva and can take 3-12 weeks after exposure to become positive. Most rapid HIV tests, including at-home self-tests are antibody test.
- Nucleic acid tests (NATs), which detect actual virus in the blood (known as the viral load). NATs may be recommended by healthcare providers if there is known HIV exposure within the past few weeks and will be the first test to become positive after exposure.

Treatment

Although there have been cases of individuals cured of HIV after receiving experimental stem cell transplants, there is currently no effective cure for HIV. HIV can be controlled with proper treatment and current guidelines recommend initiating anti-retroviral therapy (ART) as soon as an HIV diagnosis is confirmed. The goal of HIV treatment through ART is to reduce viral load to undetectable by preventing the virus from multiplying in the body. An undetectable viral load means that the level of HIV in the blood is too low to be detected

HIV MEDICATION		
DRUG CLASS	**GENERIC NAME**	**BRAND NAME**
Nucleoside Reverse Transcriptase Inhibitors (NRTIs) NRTIs block reverse transcriptase, an enzyme HIV needs to make copies of itself	abacavir (abacavir sulfate, ABC)	Ziagen
	emtricitabine (FTC)	Emtriva
	lamivudine (3TC)	Epivir
	tenofovir disoproxil fumarate (tenofovir DF, TDF)	Viread
	zidovudine (azidothymidine, AZT, ZDV)	Retrovir
Non-Nucleoside Reverse Transcriptase Inhibitors (NNRTIs) Bind to and later alter reverse transcriptase.	doravirine (DOR)	Pifeltro
	efavirenz (EFV)	Sustiva
	etravirine (ETR)	Intelence
	nevirapine (extended-release nevirapine, NVP)	Viramune Viramune XR
	rilpivirine (rilpivirine hydrochloride, RPV)	Edurant
Protease Inhibitors (PIs) Block HIV protease, an enzyme HIV needs to make copies of itself.	atazanavir (atazanavir sulfate, ATV)	Reyataz
	darunavir (darunavir ethanolate, DRV)	Prezista
	fosamprenavir (fosamprenavir calcium, FOS-APV, FPV)	Lexiva
	ritonavir (RTV) * Generally used as a pharmacokinetic enhancer	Norvir
	tipranavir (TPV)	Aptivus
Fusion Inhibitors Block HIV from entering the CD4 cells of the immune system.	enfuviritide (T-20)	Fuzeon

HIV MEDICATION		
DRUG CLASS	**GENERIC NAME**	**BRAND NAME**
CCR5 Antagonists Block CCR5 coreceptors on the surface of certain immune cells that HIV needs to enter the cells.	maraviroc (MVC)	Selzentry
Integrase Strand Transfer Inhibitors (INSTIs) Block HIV integrase, an enzyme HIV needs to make copies of itself.	cabotegravir (cabotegravir sodium, CAB)	Vocabria
	dolutegravir (dolutegravir sodium, DTG)	Tivicay Tivicay PD
	raltegravir (raltegravir potassium, RAL)	Isentress Isentress HD
Attachment Inhibitors Bind to the gp120 protein on the outer surface of HIV, preventing HIV from entering CD4 cells.	fostemsavir (fostemsavir tromethamine, FTR)	Rukobia
Post-Attachment Inhibitors Block CD4 receptors on the surface of certain immune cells that HIV needs to enter the cells.	ibalizumb-uiyk (Hu5A8, IBA, Ibalizumab, TMB-355, TNX-355)	Trogarzo
Pharmacokinetic Enhancers Used in HIV treatment to increase the effectiveness of an HIV medicine included in an HIV treatment regimen.	cobicistat (COBI, c)	Tybost

Table adapted from "FDA-Approved HIV Medicines" at https://hivinfo.nih.gov/understanding-hiv/fact-sheets/fda-approved-hiv-medicines

by a viral load test. Reducing viral load also reduces the risk of HIV transmission, where people with HIV who maintain an undetectable viral load have effectively no risk of transmitting HIV to their HIV-negative partners through sex. In order to effectively reduce viral load, HIV medications work to inhibit or block processes required for the virus to multiply. Since HIV attacks and destroys the CD4 cells of the immune system, preventing the virus from multiplying gives the immune system a fighting chance against other infections or serious illnesses. HIV medications are grouped into seven drug classes according to how they fight the virus. Usually, people on ART take a combination of HIV medications (or an HIV treatment regimen) daily. The choice of an HIV treatment regimen depends on a person's individual needs, possible side effects, and potential drug interactions. Due to the number of medications individuals may need to take to control HIV progression, adherence to the regimen is a concern. Combination medications are also available that combine multiple medications into one drug, which may improve adherence.

Conclusion

In 2019, the Ending the HIV Epidemic (EHE) initiative was announced with the goal of reducing the number of new HIV infections in the United States by at least 90% by 2030. At the time, more than 1.1 million Americans were living with HIV. Although the number of new HIV cases have declined significantly since the start of the epidemic, it is estimated that 38,000 Americans are newly diagnosed with HIV each year.

Through increased education on prevention strategies, availability of rapid diagnostic testing, and medications, public health and healthcare continue to work toward the EHE goal as well as improve the quality life for those living with HIV/AIDS.

DE-ESCALATION IN THE PHARMACY:
A GUIDE FOR EFFECTIVE COMMUNICATION

BY KIMBERLY GABRIEL

As a pharmacy technician, you are likely to encounter customers who are upset, angry, or frustrated. These situations can be challenging to navigate, Whether due to long wait times, insurance issues, or medication errors. However, effective communication and de-escalation techniques can help diffuse tense situations and provide better patient care. These also go hand in hand with an invaluable trait: empathy. De-escalation cannot exist without it. People want to be heard, understood, reassured, and validated; empathy facilitates all these things. In this article, we will explore the importance of de-escalation in the pharmacy and provide practical tips for effective communication.

WHAT IS DE-ESCALATION?

One definition of de-escalation is reducing the intensity of a conflict or potentially violent situation. In most cases, violence is not an issue; however, you never know how things may turn out, so it's important to discuss. Empathy is vital in this aspect. Effective de-escalation involves using communication techniques to calm an agitated person and prevent the situation from escalating. De-escalation is a critical skill for pharmacy technicians, as it can help prevent harm to patients, staff, and the pharmacy itself.

WHY IS DE-ESCALATION IMPORTANT IN THE PHARMACY?

Pharmacy technicians are often the first point of contact for patients seeking medical advice or assistance. As such, they are likely to encounter patients who are upset, anxious, or angry. These emotions can trigger various factors, including long wait times, medication errors, or insurance issues. If not handled properly, these situations can escalate quickly, potentially leading to physical harm or damage to the pharmacy or far worse. Effective de-escalation techniques can help pharmacy technicians manage these situations and prevent them from escalating. By using empathy and communication skills to calm an agitated patient, pharmacy technicians can diffuse tense situations and provide better patient care. Additionally, de-escalation can help build trust and rapport with patients, leading to better health outcomes and increased patient satisfaction.

TIPS FOR EFFECTIVE DE-ESCALATION

De-escalation is a skill that can be learned and practiced. Also, a thing to keep in mind: Tactical Empathy, Unaddressed emotions never die, and active listening does wonders. Tactical empathy is meeting the customer with compassion and open ears. Restate their needs and concerns back to them to reinforce their perception of your understanding. Unaddressed emotions never die. This means exactly what it says. If there is a concern that is not met or an expectation that is not satisfied, those sole issues become the main issues. Ensure you listen, cover all their concerns, and convey that you understand them. Take the time to ease all their doubts. This in itself can solve almost all problems! These other tips will provide a framework for which we can build to solve problems more efficiently.

1 Stay Calm

The first step in de-escalation is to remain calm. When faced with an upset patient, it's easy to become defensive or emotional. However, this can escalate the situation further. Instead, take a deep breath and try to remain calm and composed. The more stable you are, the better the problem is.

2 Listen

Listening is an essential part of effective communication. When a patient is upset, it's important to listen to their concerns and validate their feelings. This can help them feel heard and understood, reducing their anger or frustration. Rephrase their statements and say them back to them. This is a great way to ensure everyone is on the same page.

3 Empathize

Empathy is the ability to understand and share the feelings of another person. When a patient is upset, showing empathy and acknowledging their feelings is important. This can help them feel validated and understood, reducing their anger or frustration. Do not judge or dismiss the feelings of the person in distress. Remember that the person's feelings are real, whether or not you think those feelings are justified. Respect those feelings, remembering that whatever the person is going through could be the most important event in their life. Validation is key! Being told their emotions are in the right place sometimes is all people need to be satisfied. Quashing irrational fears and reassuring second guessers, little things are a big deal! Always try to give them the benefit of the doubt to help you put yourself in their situation.

4 Use Non-Threatening Body Language

Body language can communicate a lot about how you are feeling. When de-escalating a situation, it's essential to use non-threatening body language. This includes maintaining eye contact, keeping your arms uncrossed, and standing comfortably from the patient. The more a person is in distress, the less they hear your words —and the more they react to your nonverbal communication. Be mindful of your gestures, facial ex-

pressions, movements, and tone of voice. Keeping your tone and body language neutral will go a long way toward defusing a situation.

5 Avoid Arguing or Blaming

Arguing or blaming can escalate a situation further. Instead, focus on finding a solution to the problem. This can involve apologizing for mistakes, offering alternative solutions, or referring the patient to someone who can help them. Engaging with people who ask challenging questions is rarely productive. When a person challenges your authority, redirect their attention to the issue. Ignore the challenge, but not the person. Bring their focus back to how you can work together to solve the problem.

6 Offer Options

Offering options can help the patient feel more in control of the situation. This can involve offering alternative medications, suggesting a different pharmacy, or referring the patient to a different healthcare provider. As a person progresses through a crisis, give them respectful, simple, and reasonable limits. Offer concise and respectful choices and consequences. An upset person may not be able to focus on everything you say. Be clear, speak simply, and offer a positive choice first. It's essential to be thoughtful in deciding which rules are negotiable and which are not. If you can offer a person options and flexibility, you may be able to avoid unnecessary altercations.

7 Follow Up

Allow silence for reflection. We've all experienced awkward silences. While it may seem counterintuitive to let moments of silence occur, sometimes it's the best choice. It can allow a person to reflect on what's happening and how they need to proceed. Silence can be a powerful communication tool.

Allow time for decisions. When a person is upset, they may be unable to think clearly. Give them a few moments to think through what you've said. A person's stress rises when they feel rushed. Allowing time brings calm. (Crisis Prevention Institute)

Following up with the patient after resolving the situation can help build trust and rapport. This can involve calling the patient to check their progress, offering additional resources, or scheduling a follow-up appointment.

However…

It is imperative to keep a few things in mind when faced with a potentially violent situation. Realize that some individuals may be more adept at applying these techniques. Know your vulnerabilities and tendencies and recognize that sometimes the best intervention is knowing when to seek additional help. Maintain a safe distance and avoid being alone with an individual who is combative or potentially violent. If you feel the individual or situation escalates and violence may occur, call for help from your security staff or local law enforcement and move yourself to a safe location. If there is a risk of imminent violence, remove yourself from the situation and seek safety.

TIPS

Remain Calm: A purposeful demonstration of calmness and composure can enable de-escalation. Be aware of your non-verbal communication. Ensure your tone, facial expressions, body language, and gestures relay calm and empathy.

Remain respectful and courteous. Address the individual with civility and use phrases such as "please" and "thank you." Respect Personal Space: Maintain a safe distance and avoid touching another person. Present genuine concern and a willingness to understand without judging. If possible, remove people from the area. This could involve parties to the conflict and onlookers. Remember that patient confidentiality is vital.

VERBAL COMMUNICATION

Tone + Volume + Rate of speech + Inflection of voice = Verbal De-Escalation
Tone: Speak calmly to demonstrate empathy.
Volume: Monitor your volume and avoid raising your voice.
Rate of Speech: Slower can be more soothing.
Inflection: Avoid emphasizing words or syllables, which can negatively affect the situation. Instead Of: "Calm down." Say: "I can see that you are upset..." And rather than: "I can't help you." Say: "I want to help; what can I do?" Avoid saying: "I know how you

feel." A better choice of words would be: "I understand that you feel..." Avoid commands: "Come with me." Ask Permission: "May I speak with you?"

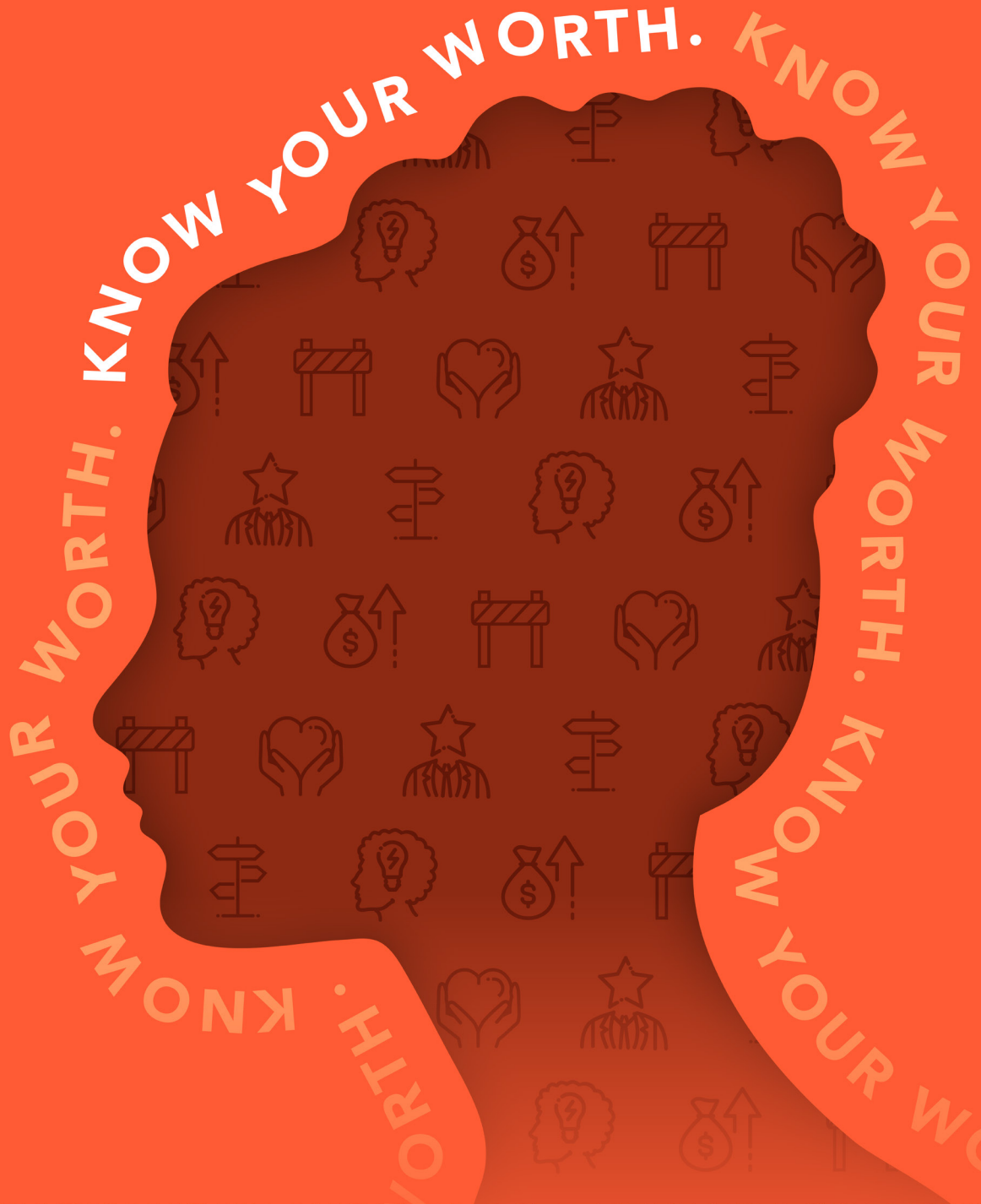
BODY LANGUAGE

Instead of standing rigidly directly in front of the person, try keeping a relaxed and alert stance off to the person's side. Rather than pointing your finger, keeping your hands down, open and visible at all times is a better option. Avoid excessive gesturing or pacing and use slow, deliberate movements while maintaining a neutral and attentive facial expression. Actions speak louder than words!

Some things to remember We cannot control what happens in the world, but we can control how we respond to it. Conflict and crisis are never as straightforward and simple in life as they are on paper. By practicing and applying some of these techniques to our situations, we can learn how to apply them in the abovementioned circumstances. We can prepare the spaces we inhabit to be more receptive to nonviolence. We can empower individuals to respond to crises more mindfully and compassionately, and we can maintain more hope for healing and recovery from the ailments patients present to us.

CONCLUSION

De-escalation is an essential skill for pharmacy technicians. By using effective communication techniques, pharmacy technicians can diffuse tense situations and provide better care for their patients. This can help prevent harm to patients, staff, and the pharmacy. As a pharmacy technician, practicing de-escalation techniques and being prepared to handle difficult situations is essential. By staying calm, listening, empathizing, using non-threatening body language, avoiding arguing or blaming, offering options, and following up, you can effectively de-escalate conflicts and provide better patient care.



KNOW YOUR WORTH AS A PHARMACY TECHNICIAN:
EMPOWERING YOURSELF IN A CHANGING LANDSCAPE

BY **MIKE JOHNSTON**, CPhT-Adv, BCNCPT, BCSCPT AND **MAX MAY**

In the dynamic and evolving world of pharmacy practice, it is paramount for pharmacy technicians to understand and embrace their intrinsic value. By recognizing the importance of positive self-esteem, fair compensation, clear boundaries, fulfillment in work, qualifications, and experience, and navigating industry challenges, pharmacy technicians can assert their worth and contribute significantly to the advancement of the profession. This comprehensive article aims to guide pharmacy technicians in empowering themselves and seizing personal and professional growth opportunities.

RECOGNIZING YOUR VALUE

Building a strong foundation of self-esteem is essential for pharmacy technicians to recognize and appreciate their worth within the healthcare team. It starts with understanding the vital role they play in patient care and the positive impact they have on individuals' lives. Pharmacy technicians are the backbone of the pharmacy practice, working alongside pharmacists to ensure the safe and efficient dispensing of medications.

In addition to their technical expertise, technicians possess a wealth of knowledge and skills that contribute to patients' overall well-being.

They have a deep understanding of medications, dosage forms, drug interactions, and regulatory guidelines. Their attention to detail and commitment to accuracy help prevent medication errors, safeguard patient health, and promote positive health outcomes. Embracing their role as valued peers within the healthcare team is crucial for pharmacy technicians. They collaborate with pharmacists, nurses, and physicians to provide comprehensive medication management. By actively participating in interdisciplinary discussions, contributing their insights, and demonstrating their expertise, technicians gain recognition as essential healthcare team members. Teamwork is a cornerstone of successful healthcare delivery, and pharmacy technicians understand its significance. They work closely with pharmacists and other healthcare professionals to ensure seamless coordination of care. Their effective communication skills, adaptability, and ability to work under pressure contribute to the smooth operations of the pharmacy, even during busy periods. To further strengthen their professional identity, pharmacy technicians can engage in continuing education and pursue certifications. These opportunities allow them to enhance their knowledge base, stay updated with the latest advancements in pharmaceuticals, and expand their skill sets. By continuously investing in their professional development, pharmacy technicians demonstrate their commitment to excellence and dedication to providing patients with the best possible care.

THE COMPENSATION CONUNDRUM

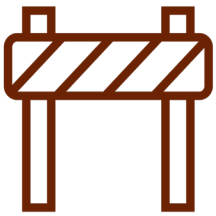
Compensation is a critical aspect of any profession, and pharmacy technicians deserve fair pay for their valuable contributions. However, the wage disparity issue within the pharmacy industry remains a challenge that must be addressed. One common misconception is that there is a shortage of pharmacists and pharmacy technicians, leading to an imbalance in supply and demand. This perception often results in undervaluing the work of pharmacy technicians and suppressing their earning potential. Pharmacy technicians must advocate for fair compensation that aligns with their skills, responsibilities, and the importance of their role in patient care. To navigate the compensation conundrum effectively, pharmacy technicians must stay informed about industry trends and wage benchmarks. Researching average salaries in their region, consulting professional organizations, and networking with peers can provide valuable insights into prevailing compensation rates.

Armed with this knowledge, technicians can negotiate their wages confidently, ensuring they are appropriately rewarded for their expertise.

It is important to recognize that compensation encompasses more than just base pay. Techni-

cians should consider the overall benefits packages, including health insurance, retirement plans, professional development opportunities, and work-life balance initiatives. These factors contribute to their financial stability, job satisfaction, and overall well-being. In addition to negotiating fair compensation individually, pharmacy technicians can collaborate with professional associations and advocate for standardized wage structures and career progression frameworks within the profession.

By coming together and raising their collective voice, technicians can drive positive change and create a more equitable compensation landscape for all. Career advancement opportunities also play a significant role in increasing earning potential for pharmacy technicians. Pursuing additional certifications, such as becoming a Certified Pharmacy Technician, can open doors to higher-paying positions and increased responsibilities. Specializing in areas such as sterile compounding, medication therapy management, or oncology pharmacy can also lead to enhanced job prospects and high salaries.



SETTING CLEAR BOUNDARIES

Establishing clear boundaries is vital for pharmacy technicians to maintain a healthy work-life balance and protect their well-being. The nature of the profession can sometimes blur the lines between personal and professional life, making it crucial to define limits and advocate for self-care. Pharmacy technicians often face demands that can extend beyond their scheduled shifts. Overtime, excessive workload, and unrealistic expectations can lead to burnout and affect job satisfaction. Pharmacy technicians need to communicate their availability and ensure that their workload aligns with their contracted hours. Setting boundaries also extends to personal interactions within the workplace.

Pharmacy technicians should establish clear guidelines regarding respectful communication, appropriate work-related discussions, and professional conduct.

By maintaining a positive work environment and fostering respectful relationships with colleagues, pharmacy technicians can enhance job satisfaction and overall well-being. Time management is another key aspect of setting boundaries. Pharmacy technicians should strive to prioritize tasks, delegate when necessary, and communicate effectively with the healthcare team to ensure efficient workflow. By managing their time effectively, they can minimize stress and create a more balanced work environment.

FINDING FULFILLMENT

Finding fulfillment in their work is essential for pharmacy technicians to maintain motivation, job satisfaction, and long-term career growth. When individuals are engaged in meaningful work that aligns with their values and passions, they are more likely to go the extra mile and positively impact patient care. Pharmacy technicians can cultivate fulfillment by actively seeing opportunities for growth and learning within their role. This can involve participating in training programs, attending conferences and workshops, and pursuing advanced certifications. By expanding their knowledge and skill sets, pharmacy technicians can take on more challenging tasks and contribute to improving patient outcomes. Collaboration and teamwork are integral to finding fulfillment in the pharmacy profession. Technicians should foster strong relationships with their colleagues and actively participate in interdisciplinary discussions.

By working closely with pharmacists, nurses, and other healthcare professionals, they can contribute their insights and expertise, resulting in better patient care and a sense of fulfillment.

Recognizing the impact they have on patients' lives is crucial for pharmacy technicians. Each medication they dispense and every interaction they have with patients contributes to the overall quality of care. They should take pride in ensuring medication safety, educating patients on proper medication use, and providing compassionate support. Understanding the difference they make in patients' lives can be a powerful source of fulfillment and motivation.

Additionally, technicians can explore opportunities for career advancement and diversification within the pharmacy profession. Specializing in areas such as geriatrics, pediatrics, compounding, or ambulatory care can provide new challenges and avenues for personal and professional growth. By continually seeking new experiences and expanding their expertise, technicians can find gratification in their work and pave the way for exciting career opportunities.

EMBRACING YOUR QUALIFICATIONS AND EXPERIENCE

Embracing your qualifications and experience as a technician is vital for professional growth, self-confidence, and career advancement. By recognizing and leveraging your expertise, you can position yourself as a valuable asset within the pharmacy profession.

First and foremost, it is essential to acknowledge the hard work and dedication you have put into acquiring your qualifications and experience. Completing a pharmacy technician training program, earning certifications, and accumulating years of practical experience are significant achievements that showcase your commitment to excellence in patient care.

In addition to formal qualifications, embracing the ongoing learning and professional development opportunities available to pharmacy technicians is essential. The field is constantly evolving, with new medications, regulations, and technologies emerging regularly. By staying abreast of these changes and actively engaging in continuing education, you demonstrate your commitment to staying current and providing the best possible care to patients.

Moreover, embracing your qualifications and experience involves effectively communicating your expertise and value to others.

Take pride in your achievements and confidently articulate your unique contributions to the healthcare team. When interacting with colleagues, pharmacists, and patients, highlight your knowledge, professionalism, and commitment to patient safety.

Embracing your qualifications and experience also involves advocating for the recognition and advancement opportunities you deserve. Take an active role in your career development by seeking supervisor feedback, identifying improvement areas, and setting professional growth goals. Actively engage in performance evaluations and discussions to demonstrate your commitment to excellence and your desire for advancement within the field.

Lastly, remember that embracing your qualifications and experience is an ongoing journey. The pharmacy field is continuously evolving, and new opportunities for growth and development will arise. Stay curious, embrace lifelong

learning, and be open to new challenges and experiences. By continuously enhancing your qualifications and broadening your skill set, you can remain at the forefront of pharmacy practice and make a lasting impact on patient care.

Embracing your qualifications and experience as a pharmacy technician is crucial for professional growth and career advancement.

Recognize the value of your formal qualifications, practical experience, and ongoing learning. Communicate your expertise confidently, mentor others, and advocate for recognition and advancement opportunities. Embrace expanded roles, engage in networking, and stay committed to lifelong learning. By doing so, you will elevate your professional standing, make a significant impact on patient care, and find fulfillment in your pharmacy career.

NAVIGATING INDUSTRY CHALLENGES

The pharmacy industry is constantly evolving, presenting pharmacy technicians with unique challenges that require adaptability and proactive engagement. By staying informed, embracing technology, advocating for patient safety, and actively participating in professional networks, pharmacy technicians can navigate these challenges successfully. Staying informed about industry trends, regulatory changes, and new pharmaceutical developments is essential for pharmacy technicians. They should actively seek out information through reputable sources, attend conferences and webinars, and engage with professional associations. By saying ahead of the cure, techs can provide the best possible care to patients and demonstrate their commitment to excellence. Technology is rapidly transforming the healthcare landscape, and technicians must embrace these advancements. Automated dispensing systems, electronic health records, and medication management software are just a few examples of technological tools that can streamline workflow, improve accuracy, and enhance patient safety Pharmacy technicians should actively engage with these technologies, seek training opportunities, and adapt to new workflows to maximize their efficiency and effectiveness.

Advocating for patient safety should be a top priority for technicians. They should be vigilant in identifying and reporting medication errors, participating in medication reconciliation processes, and implementing measures to prevent adverse drug events. By actively engaging in patient safety initiatives and championing best practices, pharmacy technicians play a vital role in protecting patients' well-being.

Engaging in online and offline professional networks allows pharmacy technicians to connect with peers, share knowledge, and exchange best practices. Platforms such as social media groups, forums, and local pharmacy associations provide opportunities to learn from others, seek advice, and collaborate on common challenges. By actively participating in these networks, pharmacy technicians can expand their professional horizons and contribute to advancing the field.

In conclusion, recognizing and embracing their worth is crucial for pharmacy technicians to thrive in their careers and contribute to the well-being of patients.

By understanding the value they bring to the healthcare team, advocating for fair compensation, setting clear boundaries, finding fulfillment in their work, and navigating industry challenges, pharmacy technicians can elevate their professional standing and make a meaningful impact on patient care.

As technicians, you are not mere support staff; you are integral members of the healthcare team. Your knowledge, skills, and dedication make a difference in patients' lives every day. Embrace your role with confidence, continuously invest in your professional growth, and never underestimate the impact you have on the quality of care provided.

Remembers, knowing your worth is not about arrogance or entitlement. It is about acknowledging the unique contributions you make and advocating for fair recognition and compensation. By valuing yourself, you set the stage for others to value you too.

So, stand tall, pharmacy technicians, and take pride in your profession.

Your commitment, expertise, and unwavering dedication deserve to be celebrated.

Embrace your worth and continue to make a positive difference in the lives of those your serve.

MOST COMMON DRUG INTERACTIONS

Author: Jim Mizner, RPh

This author has no conflict of interest to declare in conjunction with this continuing education activity.

LEARNING OBJECTIVES:

At the completion of this activity, the participant will be able to:

1. Explain the factors which may precipitate drug interactions
2. Describe the pharmacokinetic processes of absorption, distribution, metabolism, and elimination
3. Discuss the role of cytochrome P450 enzymes in the drug metabolism of medications
4. Differentiate pharmacokinetic from pharmacodynamic interactions
5. Differentiate between drug-drug, drug-food, drug-herbal supplement, and drug-disease interactions and provide examples of each

Faculty: Jim Mizner, RPh
Contact Hour(s): 2.0
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Target Audience: Pharmacists and Pharmacy Technicians
Cost: NPTA Elite/CE+ Members: FREE; NPTA Insiders/Non-Members: $10
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Completion of the post-test with minimum passing score of 70% is required to be awarded CPE contact hours.
Participants are allowed a total of two attempts to pass the post-test.

Please allow up to 10 business days for the credit to appear in your NABP CPE Monitor account.

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support@pharmacytechnician.org
888-247-8700

MOST COMMON DRUG INTERACTIONS

DID YOU KNOW?

Drug-related events often occur unexpectedly, but many can be prevented by knowing the properties and actions of the medication. Many drug-related events occur as a result of drug interactions. Drug interactions are often the result of the following:

- A drug is interacting with another drug resulting in a drug-drug interaction.
- Food or specific dietary substances which influence the activity of a drug result in a drug-food interaction.
- Herbs or other natural products affect the activity of a drug.
- A drug causing a change in the laboratory results in a drug-laboratory test interaction.
- A drug causing undesired effects in patients diagnosed with certain disease states resulting in a drug-disease interaction.

CAUSES OF DRUG INTERACTIONS

Many factors may precipitate a drug interaction; these include multiple pharmacological effects, patients utilizing multiple prescribers, taking nonprescription medications, and patient non-adherence. Most medicines prescribed can influence multiple physiological systems. The potential for interaction is great when taking various medications. Usually, the primary effects of a medication are examined, and forgetting the secondary effects. It is extremely common today for a patient to have a general practitioner for their overall health but see a specialist, such as a cardiologist, endocrinologist, or gynecologist. It is possible for a prescriber not to be aware of all the medications other practitioners are prescribing their patient. To further compound this problem, a patient may use multiple chain and independent pharmacies to fill their prescriptions. By using different pharmacies, the pharmacist may not be aware of the patient's medication regimen.

Many patients may take over-the-counter (OTC) medications to treat a variety of conditions. Although the FDA has determined these medications are safe for a patient to take without a physician's supervision, these products may cause a patient to experience adverse effects. A patient may take another over-the-counter medication to treat this effect resulting in the “cascade effect.” The cascade effect is defined “as the situation in which a first drug administered to a patient causes adverse event signs and symptoms, which are misinterpreted as a new condition, resulting in a new medication being prescribed.” It is common for a patient to forget to tell their provider about the over-the-counter medications, vitamins, and supplements they are taking. With this information, the physician and the pharmacist can identify drug interactions. Many patients do not take their medications as prescribed by their physician resulting in medication non-adherence or non-compliance. These patients may not fully understand the directions associated with taking their medicine. When considering the average elderly patient may be taking 5-6 medications to treat multiple conditions, they may become confused with their drug regimen. They may forget when to take their medication and whether or not it should be taken with food which may result in drug interactions. In some situations, the patient may not have the funds to purchase their prescription.

Patient variables include age, disease states, renal and hepatic function, social patterns such as alcohol and tobacco usage, diet, and individual variations. These factors may predispose the patient to experience adverse events to a drug. Drug-related events are common in both young and geriatric patients. In newborn infants, their enzyme system is not fully developed, which is needed to metabolize many

MOST COMMON DRUG INTERACTIONS

medications. In addition, their renal system is not fully developed. Many elderly patients have at least one chronic condition, whether it is diabetes or hypertension, resulting in the patient being prescribed multiple medications. When treating these conditions, patients with an impaired renal system may result in an altered drug response whereby the medication's dose may require to be altered. Elderly patients are more likely to experience changes in their ability to absorb, distribute, metabolize, and eliminate a drug from the body. This may result in the patient experiencing additional drug interactions and adverse events.

Some disease states other than what the medication is indicated may affect a patient's response to a medication. A patient with an impaired renal or hepatic system may impact a medication's activity in the body. Many medications are bound to plasma proteins, and only the unbound portion of the medication is active, whereby a decreased concentration of the protein could influence the availability of the drug and its action. This must be considered when an individual has a condition with hypoalbuminemia. A physician must be aware of a patient's liver function. Reduced hepatic function may affect a patient's drug clearance, biotransformation, and pharmacokinetics. The presence of disease-causing factors such as alterations in intestinal absorption, plasma protein binding, liver blood flow, and renal clearance can affect the liver's ability to metabolize a medication. These alterations may increase the levels of a bioavailable drug resulting in normal drug doses to demonstrate toxic effects. In patients diagnosed with either cirrhosis or jaundice, the pharmacy Unfortunately, it is extremely difficult to modify a patient's dosage if they have a reduced hepatic function.

A prescriber must be cognizant of a patient's renal function, especially when a medication's active form is eliminated by the kidney are prescribed for a long period. When renal impairment exists, the patient may become more susceptible to certain drug effects. A patient with renal disease may observe an increased or decreased drug effect. Some

medications prescribed to a patient at their normal dose may experience elevated steady-state concentrations if they have renal impairment.

Social behaviors, including an individual's alcohol consumption, smoking, and diet, can influence drug interactions. Alcohol may affect the metabolism and enhance the effect of the medication. Alcohol interacts with numerous drug classifications, including antidepressants, antihistamines, barbiturates, benzodiazepines, histamine H2 receptor antagonists, muscle relaxants, nonnarcotic pain medications and anti-inflammatory agents, and opioids. Simultaneous use of alcohol with these drug classifications results in an excessive depressant effect. Tobacco smoke interacts with medications by affecting the absorption, distribution, metabolism, or elimination of a drug resulting in a modified pharmacologic response. As a result, smokers may require higher doses of medications to obtain therapeutic doses. Upon smoking cessation, a patient's dose may need to be reduced.

MEDICATION	MECHANISM OF INTERACTION AND EFFECTS
Alprazolam	Decreases plasma concentration of alprazolam
	Decreases half-life of alprazolam
Clopidogrel	Increases induction of CYP1A2 to its active metabolite
	Effects are increased in smokers (10 or more cigarettes per day) resulting in increased platelet inhibition and decreased platelet aggregation
Clozapine	Increased metabolism induction of CYPIA2 resulting in decreased plasma concentration of clozapine
	Increases clozapine levels may appear upon smoking cessation and therefore clozapine levels need to be monitored to avoid toxicity
Flecainide	Increases clearance level and decreases serum concentrations of flecainide. Smokers may need to have their daily dosages increases
Fluvoxamine	Increases metabolism (induction of CYP1A2; increases drug clearance and decreases plasma concentration of fluvoxamine
	Dosages may need to be increased for smokers
Heparin	Increased clearance and decreased half-life of heparin.
	Smoking has prothrombotic effects
	Dosages may need to be increased due to pharmacokinetic and pharmacodynamic effects
Insulin	Decreases insulin absorption due to peripheral vasoconstriction
	Smoking may cause the release of endogenous substances resulting in insulin resistance
	Smokers may need to have insulin dosages increase
Olanzapine	Increases metabolism (induction of CYP1A2) of olanzapine
	Increases clearance
	Decreases serum concentrations
	Smokers may need to have their daily dosages increased
Propranolol	Increases clearance of propranolol
Ropinirole	Decreases Cmax and area under the curve (AUC) in patients diagnosed with restless legs syndrome
	Smokers may need to have their ropinirole dosages increased
Tacrine	Increases metabolism (induction of CYPA2) and clearance of tacrine
	Decreases tacrine half-life
	Smokers may need to have their dosages increased
Theophylline	Increases metabolism (induction of CYP1A2 for theophylline
	Decreases theophylline half-life
	Theophylline levels should be monitored if smoking is started, stopped or changed
	Maintenance doses are higher in smokers
	Increased clearance of theophylline in patients exposed to second-hand smoke exposure
Warfarin	Increased metabolism (induction of CYP1A2) of R-enantiomer however S-enantiomer is more potent
	INR must be monitored with smoking cessation

MOST COMMON DRUG INTERACTIONS

DRUG CLASSIFICATION	MECHANISM OF ACTION AND EFFECTS
Benzodiazepines	Decreased sedation and drowsiness attributed to stimulation of the central nervous system
Beta-blockers	Less effective antihypertensive and heart rate control due to nicotine-mediated sympathetic activation
	The dosage of beta-blockers may need to be increased
Corticosteroids (inhaled)	Smokers diagnosed with asthma may have less of a therapeutic response to inhaled corticosteroids
Hormonal contraceptives	Increased risk of cardiovascular effects to include stroke, myocardial infarction, and thromboembolism of females who use oral contraceptives
	Increase risk with age in females who smoke 15 or more cigarettes per day, especially in females older than 35 years of age
Opioids	Decreased analgesic effect
	Smokers may need to increase opioid dosages for pain relief

Food may affect the rate and extent of drug absorption from the gastrointestinal tract. For example, many antibiotics should be taken one hour before or two hours after a meal to ensure maximum absorption of the drug. Dairy products containing calcium may decrease the absorption of tetracyclines and fluoroquinolones through the process of chelation. For patients taking warfarin, some dietary products such as spinach and romaine lettuce contain high levels of vitamin K, which can affect the therapeutic effect of warfarin.

PHARMACOKINETICS AND PHARMACODYNAMICS

A patient is often treated with more than one medication, whether it is a prescription, over-the-counter (OTC) medication, a vitamin, or an herbal supplement. Drug interactions may affect the pharmacokinetics and pharmacodynamics associated with a medication. Pharmacokinetics refers to the movement of the medication throughout the body and consists of the absorption, distribution, metabolism, and elimination (excretion) processes. Patient-related factors and the medications' chemical properties can affect the pharmacokinetics of medication. Examples of patient-related factors include the patient's renal function, age, and sex. Drug absorption is affected by the drug's physicochemical properties, formulation, and route of administration. Dosage forms such as tablets, capsules, and solutions contain the active ingredient and other inserted substances. These dosage forms are formulated to be administered by various routes (e.g., oral, rectal, parenteral, topical, and inhalational). Regardless of the route of administration, a medication must be in solution to be absorbed into the body. A medication may be absorbed into the body by:

- Passive diffusion is the method by which molecules travel from an area of higher concentration to an area of lower concentration. A drug molecule's lipid solubility, size, and degree of ionization can affect the diffusion rate of the medication.
- Facilitated passive diffusion is the passive movement of molecules along the concentration gradient whereby the membrane only permits selective molecules to pass through but prevents other molecules from passing through.
- Active transport is a selective process requiring energy and may include transport against a concentration gradient. Active transport is limited to drugs structurally similar to endogenous substances, such as ions, vitamins, sugars, and amino acids.
- Pinocytosis is the process by which fluid or particles are surrounded by a cell.

Drug distribution is the movement of a drug to and from the blood and various tissues of the body, such as fat, muscle, and brain tissue. Factors affecting medication distribution include blood flow rate, tissue permeability, and protein binding. The blood flow rate to the organs and tissues affects the distribution of the medication. Medications that are rapidly distributed to the organs such as the heart, kidneys, and liver possess high blood flow rates. Meanwhile, medications distributed to the muscles, skin, and fat have slower blood flow rates. Drugs enter different tissues at different speeds, subject to the medication's capability to cross membranes. Fat-soluble drugs can cross cell membranes more quickly than water-soluble drugs can. Some drugs exit the bloodstream slowly because they bind tightly to blood plasma proteins. Those medications which leave the bloodstream quickly and enter other tissues can do so because they are less tightly bound to blood proteins. Some of the molecules of a drug in the blood may be bound to blood proteins, whereby the protein-bound part is normally inactive. As an unbound drug is distributed to tissues and its level in the bloodstream decreases, blood proteins gradually release the drug bound to them. Thus, the bound drug in the bloodstream may act as a depot for the drug. Drug metabolism refers to the chemical alteration of medication by the body. Drugs can be metabolized through oxidation, reduction, hydrolysis, hydration, conjugation, or condensation. Metabolism enables a drug to be more easily excreted. In the liver, a drug entity is converted to a metabolite. Some metabolites are active and capable of producing an effect. Most metabolites are inactive and are easily excreted from the body.

Several processes may occur during the metabolism of medication. They include:

- Enzyme induction refers to an increase in the hepatic enzyme activity resulting in the greater metabolism of medication.
- Enzyme inhibition refers to the decrease in hepatic enzyme activity resulting in the reduced metabolism of medication.
- The first metabolism is the substantial degradation of an orally administered drug caused by enzyme metabolism in the liver before the drug reaches systemic circulation.
- Enterohepatic cycling is the process of transferring a drug and its metabolite from the liver to the bile found in the gall bladder, then to the intestine and back into circulation.

Drug elimination (excretion) refers to the removal of medication from the body. All drugs are eliminated from the body. Elimination may occur after the medication is metabolized or excreted intact. A medication may be eliminated in the patient's urine, bile, saliva, sweat, exhaled air, and breast milk. Specific characteristics of the medication may affect the kidneys' ability to excrete medication. To be completely excreted in the urine, a drug or metabolite must be water-soluble. In addition, the medication must not be completely bound too tightly to proteins in the bloodstream.

Factors affecting the urinary excretion of medication include:

- An impaired kidney. An impaired kidney will result in less medication being excreted and accumulating in the blood. As a result of an impaired kidney, the medication dosage must be reduced or the dosing interval lengthened.
- Urine pH. The pH of urine can affect the medication's reabsorption of some medications. A high pH can increase the excretion of weak acids, such as salicylate. Meanwhile, a high pH can decrease the excretion of a weak base.
- Other medications. Some medications can affect the excretion of other medications. In some situations, the affected drug will accumulate in the blood, and therefore, the medication dosage must be reduced or the dosing interval increased.

Pharmacodynamics refers to the study of a medication' molecular, biochemical, and physiologic effects of drugs on the body. Pharmacodynamics involves receptor binding and chemical interactions and helps explain the relationship between the drug's effects. The pharmacologic response depends on the drug binding to its target. The drug concentration at the receptor site impacts the drug's effect.

MOST COMMON DRUG INTERACTIONS

ROLE OF PHARMACOKINETIC INTERACTIONS AND PHARMACODYNAMIC INTERACTIONS

Pharmacokinetic interactions are defined as one in which the medication alters the absorption, distribution, metabolism, and elimination of another medication resulting in a change in the plasma concentration of the second agent. Pharmacodynamic interactions are those in which medications having similar or opposing pharmacological effects are administered simultaneously and in situations in which the reaction of the tissues to one medication is changed by another medication. A pharmacodynamic may also occur when there is a change in the medication's effect without a change in the drug plasma concentration.

Drug interactions can affect the absorption of medication by varying mechanisms of action. These interactions may reduce the absorption of the medication and therefore affects its therapeutic effect. A medication's absorption may be delayed but will eventually be completely absorbed. The delay of a medication's absorption can have serious consequences, especially if the therapeutic response is needed quickly. There are several means that the absorption of medication in the body can be influenced. These methods include complexation, gastric emptying, gastric pH, and intestinal metabolism. A medication may make a nonabsorbable substance by attaching it to another medication. This results in the decreased absorption of the medication.

An example of complexation would be an iron tablet binding to tetracycline and decreasing the absorption of tetracycline in the body. Some medications may delay gastric emptying and, as a result, delay the absorption of another medication. For example, if a patient is prescribed both propantheline and acetaminophen, the propantheline will slow acetaminophen absorption by reducing the rate of gastric emptying. Medications that modify gastrointestinal pH can have different effects on the absorption of other medications. The amount of unionized medication available for absorption, the rate of dissolution, and intestinal motility can be affected by the pH. Changes in intestinal metabolism can affect the absorption of a medication. An example occurs when a patient is prescribed both antibiotics and an oral contraceptive. The antibiotic eradicates the normal bacterial flora, which interrupts the enterohepatic recycling of the oral contraceptives estrogen. As medication is distributed throughout the body, the medication may displace another medication from a protein-binding site. This displacement increases the amount of medication available for distribution, and the displaced medication is eliminated quicker since most of the free drug is available for metabolism. Often displacement happens during the first two weeks after a medication has been started. A medication's therapeutic effect is changed as a result of displacement. Medication displacement occurs if a medication is highly protein bound. Medication displacement.

Drug metabolism occurs in the liver and consists of processes involving oxidation, reduction, hydrolysis, and conjugation. Cytochrome P-45 enzymes and their substrates play an important role in the oxidation and hydroxylation of many medications. Many drug interactions have occurred as the result of one medication stimulating the metabolism of other medications as a result of specific hepatic enzymes. These enzymes are referred to as enzyme inhibitors and enzyme inducers.

Enzyme induction is the process by which a medication increases the concentration of metabolizing enzymes in the liver and reduces the pharmacological effect of the medication. Carbamazepine, phenytoin, rifampin, and St John's wort are examples of enzyme inducers. Cigarette smoking and alcohol usage may induce the metabolism of medications. Enzyme induction may be influenced by a patient's age, genetics, and liver disease. In some situations, enzyme induction may be dose related.

Enzyme inhibition occurs when two medications vie for the same binding sites located on the same metabolizing enzyme. Enzyme inhibition results in an increased plasma concentration and pharmacological effect of the medication. Examples of enzyme inhibitors include cimetidine, ciprofloxacin, fluoxetine, and omeprazole. Enzyme inhibition has a rapid onset of action and disappears quickly upon the discontinuation of the inhibitor. It is dose related. Many medications with the chemical structure are prone to display enzyme inhibition.

CYP ENZYME	SUBSTRATES	INHIBITORS	INDUCERS
CYP 1A2	caffeine	cimetidine	broccoli
	clozapine	ciprofloxacin	Brussel sprouts
	imipramine	amiodarone	insulin
	olanzapine	fluvoxamine	tobacco
	theophylline		
CYP 2B6	bupropion	ticlopidine	phenobarbital
	methadone		rifampin
CYP2C8	torsemide	gemfibrozil	rifampin
	repaglinide	glitazone	
		montelukast	
CYP2C9	celecoxib	fluconazole	rifampin
	ibuprofen	fluoxetine	
	losartan		
	phenytoin		
	warfarin		
CYP219	amitriptyline	cimetidine	carbamazepine
	carisoprodol	fluoxetine	norethindrone
	clomipramine	ketoconazole	
	cyclophospha-mide	lovastatin	
	diazepam	lansoprazole	
	indomethacin	omeprazole	
	omeprazole	probenecid	
	rabeprazole	sertraline	
	phenytoin	sulfamethox-azole	
	progesterone	ticlopidine	
	propranolol		
CYP2C9	glyburide	amiodarone	rifampin
	glipizide	fluconazole	
	ibuprofen	fluvastatin	
	irbesartan	fluvoxamine	
	losartan	isoniazid	
	meloxicam	sulfamethox-azole	
	phenytoin	zafirlukast	
	rosiglitazone		
	tamoxifen		
	warfarin		
CYP2D6	amitriptyline	amiodarone	dexametha-sone
	carvedilol	bupropion	
	codeine	celecoxib	rifampin
	dextrometho-rphan	cimetidine	
	duloxetine	clomipramine	
	fluoxetine	escitalopram	
	haloperidol	fluoxetine	
	imipramine	paroxetine	
	ondansetron	ritonavir	
	paroxetine	sertraline	
	risperidone		
	tamoxifen		
	timolol		
	tramadol		
	venlafaxine		
	acetamino-phen	disulfiram	ethanol
	chlorzoxazone		isoniazid
	ethanol		
CYP3A	alprazolam	amiodarone	carbamazepine
	amlodipine	cimetidine	efavirenz
	atorvastatin	clarithromycin	phenobarbital
	clarithromycin	diltiazem	phenytoin
	codeine	fluvoxamine	pioglitazone
	cyclosporine	grapefruit juice	rifampin
	diazepam	itraconazole	St John's wort
	diltiazem	ketoconazole	
	erythromycin	nefazodone	
	estradiol	ritonavir	
	lovastatin	verapamil	
	midazolam		

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	nifedipine		
	progesterone		
	sildenafil		
	tamoxifen		
	trazodone		
	verapamil		

Enzyme inhibition occurs when two medications vie for the same binding sites located on the same metabolizing enzyme. Enzyme inhibition results in an increased plasma concentration and pharmacological effect of the medication. Examples of enzyme inhibitors include cimetidine, ciprofloxacin, fluoxetine, and omeprazole. Enzyme inhibition has a rapid onset of action and disappears quickly upon the discontinuation of the inhibitor. It is dose related. Many medications with the chemical structure are prone to display enzyme inhibition.

Most drugs and their metabolites are eliminated through the kidneys. Glomerular filtration, renal secretion, renal secretion, and urinary reabsorption affect the elimination of medication from the body. Medications produce changes in the glomerular filtration rate and the drug's elimination rate.

Acidic and basic drugs utilize different transport systems. Acidic medications do not vie for the basic transport system and basic medications do not compete for the acidic transport system. Two acidic or two basic medications will fight for the same transport system. As a result, one or both of the medications may collect in the blood. Some medications may battle with each other and result in a medication being eliminated from the body. An example of this occurs when a patient is taking both probenecid and penicillin and the probenecid reduces the penicillin's secretion rate. Urinary transport is a passive transport system and is changed by the pH of the urine and the medication's ionization. In acidic urine, acidic drugs are reabsorbed while basic drugs are not. This results in basic drugs being eliminated from the body. Meanwhile, in alkaline urine, acidic medications will not be reabsorbed but will be eliminated in the urine while basic medications are reabsorbed.

A medication's pharmacodynamics can be affected by physiologic changes due to a disease or disorder, the aging process, and other medications. Disorders that impact pharmacodynamic reactions include genetic mutations, malnutrition, and some forms of insulin-resistant diabetes mellitus. Disease states can alter receptor and protein binding. In addition, disease states can decrease receptor sensitivity.

Aging tends to impact pharmacodynamic responses by altering receptor binding. Older patients are more likely to take many medications including medicinal herbs and dietary supplements. At times they may not share this information with their physician. Pharmacodynamic drug-drug interactions result in competition for receptor-binding sites. Pharmacodynamic drug interactions may occur in medications having competing pharmacological effects, similar pharmacological actions, and those competing for the same receptor site. Interactions resulting from the use of two drugs with opposing drug effects are easiest for pharmacists and pharmacy technicians to identify. However, sometimes these interactions are due to the secondary effects of these medications. For instance, thiazide diuretics are known to elevate glucose levels in patients.

When a diuretic is prescribed for a diabetic patient being treated with insulin or oral antidiabetic agents, this action responds to the glucose-lowering action of the antidiabetic agent, and therefore a change in dosage is necessary. An excessive response rate attributed to the concurrent use of medications having similar actions is extremely common in CNS depressants, alcohol and other CNS depressants, anticholinergic medications, NSAIDs, and medications demonstrating hypotensive effects.

DRUG-DRUG INTERATIONS

Many patients are often treated with more than one medication, whether it is a prescription or over-the-counter medication. A method of classifying these interactions is based on the effect it has on the body. Terminology associated with drug-drug interactions include:

- Additive, which occurs when the combined effect of two drugs equals the effect of each agent given alone. An additive effect would be a patient being prescribed sulfamethoxazole and trimethoprim in treating pneumonia in a patient diagnosed with AIDS.
- Synergistic, which happens when the combined effect of the two medications exceeds the sum of the effects of each drug given alone. An example of a synergistic effect would involve a patient taking both warfarin and aspirin concurrently. Aspirin increases the possibility of bleeding in anticoagulated patients because it prevents platelet function while causing gastric problems.
- Potentiation describes the creation of a toxic effect from one drug due to the presence of another drug. An example of potentiation is a patient being prescribed penicillin and probenecid, where the probenecid is prolonging the activity of penicillin.
- Antagonism is the interference of one drug with the action of another drug. In some situations, drug antagonism may provide a therapeutic advantage when one drug is used as an antidote for the toxicity of another drug. There are several forms of antagonism, and they consist of
  - Functional or physiological antagonism occurs when two chemicals produce opposite effects on the same physiological function. Functional (physiological) antagonism is often used in treating drug overdoses.
  - Chemical antagonism (inactivation) is a reaction between two chemicals to counteract their effects, such as used in chelation therapy.
  - Dispositional antagonism is the modification of the nature of the substance (its absorption, metabolism, distribution, or elimination) so that it reaches the target organ.
- Receptor antagonism involves the blockade of the drug with another drug that competes for the receptor site. An antidote refers to a particular medication that is given to block or reduce the block the toxic effects of another medication. An antidote's action creates an antagonistic effect. An example of using an antidote is the administration of protamine sulfate to treat an overdose of heparin.

DRUG OR CLASSIFICATION		EFFECT
ACE inhibitors (i.e. lisinopril, enalapril, captopril)	Potassium Supplements (i.e., potassium chloride)	ACE inhibitors increase the levels of potassium in the body. Thus, if potassium supplements are co-administered with ACE inhibitors, there is a potential for elevated potassium levels in the blood (known as hyperkalemia)
ACE inhibitors (i.e. lisinopril, enalapril, captopril)	Potassium-sparing diuretics (i.e. spironolactone, Dyrenium)	Spironolactone increases blood potassium levels, which is an additive to the blood potassium-increasing effect of ACE inhibitors. Hyperkalemia occurs when there is a high potassium level in the body.
Carbamazepine	Cimetidine, erythromycin, and fluconazole	Increases carbamazepine levels; monitor carbamazepine levels
Carbamazepine	Rifampin	Decreased carbamazepine levels; monitor carbamazepine levels
Digoxin	Amiodarone	Amiodarone may lead to increased levels of digoxin in the body and potential toxicity.
Digoxin	Quinidine	Quinidine may increase plasma concentration levels of digoxin due to its decreased volume of distribution of digoxin. Quinidine also decreases renal and nonrenal excretion rates of digoxin, leading to increased steady-state concentrations of digoxin.
	methadone	

MOST COMMON DRUG INTERACTIONS

Digoxin	Verapamil	Verapamil may decrease the clearance of digoxin, leading to increased levels of digoxin in the body and potential toxicity. Intake of digoxin and verapamil together may result in excessive slowing down of the heart
Fluoro-quinolones (i.e., cipro-floxacin)	Theophylline	Fluoroquinolones inhibit the metabolism of the-ophylline. This results in a high level of theophylline in the blood and may lead to theophylline toxicity and an increased likelihood of seizures
	repaglinide	glitazone
Fluoro-quinolones (i.e., cipro-floxacin)	Warfarin	Quinolones interact with warfarin resulting in de-creased metabolism and clearance of warfarin. In addition, antibiotics kill bacteria in the digestive tract that produce vitamin K, thereby increasing the effect of warfarin. This increases the effects of warfarin, with the potential for excessive bleeding.
Fluoro-quinolones (i.e., cipro-floxacin)	Sucralfate	Sucralfate will decrease the absorption of fluoroquinolone
HMG-CoA reductase inhibitor	Niacin, gemfibro-zil, erythromycin, or itraconazole	May cause rhabdomyoly-sis: monitor the patient for toxicity
Lithium	Nonsteroidal anti-inflammatory drug (NSAID)	NSAIDs will increase lith-ium levels: and decrease lithium dosage
Lithium	Diuretics	Diuretics will increase lithi-um levels; decreas lithium dosage
Methotrex-ate	Probenecid	Methotrexate taken with probenecid can increase methotrexate levels. Probe-necid prevents the excre-tion of methotrexate.
Oral con-traceptives	Antibiotics	Antibiotics decrease oral contraceptive effective-ness; recommend the use of alternative contraceptive methods during the cycle.
Oral con-traceptives	Rifampin	Rifampin decreases the effectiveness of oral contra-ceptives; if necessary to be prescribed together have the patient take a higher estrogen content product or alternative method of contraception.
Phenobar-bital	Cimetidine, erythromycin, clarithromycin, or fluconazole	Increased phenobarbital levels; monitor phenobarbital levels
Phenytoin	Cimetidine, erythromycin, clarithromycin or fluconazole	Increased phenytoin levels; monitor phenytoin levels
Phenytoin	Rifampin	Rifampin decreases phenytoin levels: monitor phenytoin levels
Potassium Chloride	Spironolactone	Potassium chloride and spi-ronolactone taken together may result in hyperkalemia which may result in cardiac arrest.
Propranolol	Clonidine	Taken simultaneously propranolol and clonidine may result in hypertension. Withdrawal of clonidine may result in rebound hypertension.
Selective serotonin reuptake inhibitors (SSRI) (i.e. fluoxetine, paroxetine, sertraline)	Monoamine oxidase inhibitors (MAOIs) (i.e. phenelzine, tra-nylcypromine)	Central serotonin syn-drome may occur if an SSRI is taken with MAOI. It is recommended that an SSRI be stopped for at least 5 weeks before an MAOI is prescribed due to its long half-life. An MAOI should be discontinued for 2 weeks before starting SSRI therapy.
Selective serotonin reuptake inhibitors (SSRI) (i.e. fluoxetine, paroxetine, sertraline)	Tricyclic antide-pressant (TCA) (i.e., amitriptyline, imipramine)	Monitor for anticholinergic effects: consider reducing tricyclic antidepressant dosage

Selective serotonin reuptake inhibitors (SSRI) (i.e. fluoxetine, paroxetine, sertraline)	Rizatriptan, sumatriptan, or zolmitriptan	This may result in serotonin syndrome; monitorfor signs of serotonin syndrome
Selective serotonin reuptake inhibitors (SSRI) (i.e. fluoxetine, paroxetine, sertraline)	Selegiline	May result in a hypertensive crisis
Selective serotonin reuptake inhibitors (SSRI) (i.e. fluoxetine, paroxetine, sertraline)	Tramadol	This may result in an increased potential for seizures and serotonin syndrome
Phosphodi-esterase-5 (PDE5) inhibitor (i.e., sildenafil, tadalafil)	Nitrates (i.e. nitroglycerin, isosorbide mononitrate)	In the presence of PDE5 inhibitors, nitrates can cause hypotension in a patient's blood pressure
Warfarin	Lovastatin	Lovastatin may increase the effect of warfarin; monitor INR
Warfarin	Macrolides (i.e. azithromycin, clarithromycin, and erythromycin), sulfonamides (i.e. trimethoprim/sulfamethoxazole), and metronidazole.	Macrolides reduce the metabolism and clearance of warfarin, resulting in increased levels and effects of warfarin like bleeding
Warfarin	Nonsteroidal Anti-Inflammatory Drugs (NSAIDs) (i.e. aspirin, ibuprofen, naproxen)	NSAIDs interact with warfarin and can result in serious gastrointestinal bleeding and increased INR
Warfarin	Phenytoin	Phenytoin can lead to increased effects of warfarin while warfarin can increase the blood levels of phenytoin

Although over-the-counter (OTC) medications can be purchased without a prescription and are safe to use when taken as directed, drug interactions can occur. There is an Increased risk of central nervous system (CNS) depression and anticholinergic effects when over-the-counter medications are purchased to treat seasonal allergies.

Using antihistamines, such as diphenhydramine, with other medications that have anticholinergic effects could increase the risk of adverse events. This can be especially troubling in elderly patients who already have an increased risk of sedation, confusion, and urinary retention associated with anticholinergic medications.

In addition, antihistamines are contraindicated with solid oral dosage forms of potassium due to the risk of gastrointestinal irritation and ulceration.

Over-the-counter decongestants, such as pseudoephedrine, may elevate a patient's blood pressure if they are taking antihypertensives or monoamine oxidase inhibitors. Dextromethorphan inhibits neuronal reuptake of serotonin and, therefore, can interact with MAOIs and should be avoided.

A variety of OTC gastrointestinal medications include acid suppressants which include proton pump inhibitors (PPIs), histamine-2 receptor antagonists (H2RAs), and antacids that interact with other medications. Acid suppressants are capable of changing the absorption rates of other medications by raising gastric pH. Orally ad by ministered cephalosporins, such as cefuroxime, bisphosphonates, azole antifungal agents, and non-nucleoside reverse transcriptase inhibitors, are among the drugs that are most affected by reduced stomach acidity.

PPIs are potent acid-suppressing medications and are capable of producing significant pH-related interactions. Omeprazole and esomeprazole are weak CYP2C19 inhibitors that can interact with other medications. They interact with clopidogrel, which is a prodrug that is metabolized via CYP2C19 to its active form. Due to the risk of omeprazole and esomeprazole inhibiting the production of the active metabolite and decreasing antiplatelet action, it is recommended that they are not taken with clopidogrel.

MOST COMMON DRUG INTERACTIONS

Histamine-2 receptor antagonists (H2Ras) have a shorter duration of action compared to PPIs and can be given to a patient if the doses are separated by an appropriate amount of time between doses. Famotidine is recommended over cimetidine to avoid increasing the risk of enzyme pathway interactions.

Antacids possess a quick onset of action and shorter duration of action compared to PPIs and H2Ras but cause chelation-type interactions. Chelation-type interactions occur between tetracycline, fluoroquinolones, and levothyroxine which decrease a medication's absorption and therapeutic effects. Sodium phosphate laxatives have been shown to cause acute phosphate nephropathy when used before a colonoscopy or in patients being treated with diuretics, angiotensin-converting enzyme (ACE) inhibitors, angiotensin II receptor blockers (ARBs) and nonsteroidal anti-inflammatory drugs (NSAIDs). Loperamide, an antidiarrheal), when used in high doses, can cause CNS depression and QTc interval prolongation. Bismuth subsalicylate may increase a patient's bleeding risk if the patient is taking anticoagulants, antiplatelet therapies, or anticoagulants.

Levonorgestrel is available as an over-the-counter medication indicated for emergency contraception. Enzyme-inducing products, such as carbamazepine, phenytoin, topiramate, rifampin, and St John's wort, may decrease plasma levonorgestrel concentrations and reduce its efficacy.

DRUG-FOOD INTERACTIONS

Many medications have potent ingredients that interact with the body. An individual's lifestyle and diet can have a substantial impact on a medication's ability to treat a disease or condition. Interactions between food products and herbal supplements do occur.

Major side-effects of diet on drugs include a change in absorption by fatty, high protein, and fiber diets. Some drug-food interactions occur as a result of chelation with food components. An individual's physiological response to food may reduce the bioavailability of specific medications.

DRUG OR CLASSIFICATION	FOOD	EFFECT
Acetaminophen	Alcohol beverages	Products containing acetaminophen should not be taken with alcohol because it has a higher chance of causing severe liver damage
Acetaminophen	Food	Acetaminophen should be taken on an empty stomach because food may slow the absorption of acetaminophen
Angiotensin-converting enzyme (ACE) inhibitors (i.e. lisinopril, enalapril, and captopril)	Food	Absorption of ACE inhibitor is increased when taken on an empty stomach
Antihistamines (i.e. fexofenadine, loratadine, cetirizine)	Food	Take antihistamines on an empty stomach to increase their effectiveness
Antihistamines (i.e. fexofenadine, loratadine, cetirizine)	Alcohol	An increase in drowsiness may occur antihistamines are taken with alcohol.
Azithromycin	Food	Absorption and bioavailability is reduced
Bisphosphonates (i.e. alendronate)	Food	Food decreases the absorption and effectiveness of bisphosphonates in the body
Calcium channel blockers (i.e. amlodipine, diltiazem, nifedipine, felodipine, nicardipine)	Grapefruit juice	Grapefruit juice changes the way calcium channel blockers breakdown in the body and may cause overly high levels of the drug in the blood, raising the risk of side effects
Cimetidine	Food	The bioavailability of cimetidine is increased with food

Digoxin	High fiber diets	Dietary fiber, specifically insoluble fiber such as wheat bran, can slow down the absorption of digoxin and reduce its effectiveness. Digoxin should be taken at least one hour before or two hours after eating a meal.
Esomeprazole	High-fat meal	The bioavailability of esomeprazole is reduced
Fluoroquinolones (i.e., ciprofloxacin)	Food	Food forms a complex with fluoroquinolones resulting in reduced bioavailability
HMG-CoA reductase inhibitors (i.e., atorvastatin, simvastatin, and lovastatin)	Grapefruit juice/grapefruit	Grapefruit juice may increase the blood levels of atorvastatin, simvastatin, and lovastatin and increase a patient's risk for complications such as rhabdomyolysis
Ibuprofen	Coca-Cola	Coca-Cola increases the absorption of ibuprofen
Insulin	Alcohol	Alcohol prolongs the effects of insulin, which leads to hypoglycemia. The glucose-lowering action of alcohol can last as long as eight to 12 hours.
Isoniazid	Food	Food decreases isoniazid bioavailability
Levothyroxine	Food	Food blocks the absorption of levothyroxine in the small intestine resulting in a lower therapeutic dose being distributed through the body
Levothyroxine	Caffeine	Caffeine blocks the absorption of levothyroxine in the small intestine resulting in a lower therapeutic dose being distributed through the body.
Lovastatin	Food	Food improves gastrointestinal absorption and bioavailability
Metronidazole	Alcohol	Metronidazole interferes with the metabolism of alcohol resulting in the patient vomiting
Monoamine oxidase inhibitors (i.e. phenelzine)	Tyramine-containing food products (i.e. aged cheeses, aged red wines, tap or draft beer, air-dried meats, yeast extract, aged red wines, sauerkraut, and soy sauce.	May result in a hypertensive crisis
Nifedipine	Grapefruit juice	Increases the bioavailability of the calcium channel blocker
Nonsteroidal anti-inflammatory drugs (NSAIDs)(i.e. ibuprofen, naproxen)	Food	NSAIDs should be taken with food to avoid stomach irritation
Oral diabetic medications	Alcohol	Alcohol prolongs the effects of oral diabetic medications, which leads to hypoglycemia. The glucose-lowering action of alcohol can last as long as eight to 12 hours.

MOST COMMON DRUG INTERACTIONS

Propranolol	Protein-rich food	Propranolol serum levels may be increased
Tetracyclines (i.e. tetracycline and doxycycline)	Dairy products, antacids, iron-containing products	Dairy products chelate with tetracycline and inhibit the absorption of tetracycline. Tetracycline should be taken an hour before or two hours after meals
Selective serotonin reuptake inhibitors (i.e. fluoxetine, paroxetine, sertraline)	Alcohol	Combining alcohol with an SSRI may result in gastrointestinal bleeding
Sildenafil	Grapefruit juice	Grapefruit juice elevates the blood levels of sildenafil
Theophylline	High-fat meal	Increases the bioavailability of theophylline
Theophylline	Grapefruit juice	Increases the bioavailability of theophylline
Theophylline	Caffeine	Increases the bioavailability of theophylline
Theophylline	Alcohol	Increases the risk of side effects such as nausea, vomiting, headache, and irritability
Theophylline	Caffeine	Consuming large quantities of caffeine increases the risk of toxicity
Warfarin	Green leafy vegetables (i.e., spinach, romaine lettuce, kale, asparagus)	The highest concentrations of vitamin K are found in green leafy vegetables. Vitamin K is essential for the production of clotting factors that help prevent bleeding, but anticoagulants like warfarin exert their effect by inhibiting vitamin K. Therefore, an increased intake of the nutrient can antagonize the anticoagulant effect and prevent the drug from working.
Warfarin	Charbroiled foods	Decreases warfarin activity
Warfarin	Cranberry juice	Elevates INR without bleeding in elderly patients
Warfarin	Cooked onions	Increases warfarin activity

A class of chemicals known as furanocoumarins is found in grapefruit. These chemicals cause an increase in the medication's potency. They interact with the cytochrome P450 3A4 (CYP3A4) enzyme, which partly inactivates many medications. However, the furanocoumarins weaken the action of CYP3A4, permitting the activity of some medications to achieve much higher concentrations than normal, resulting in adverse effects.

Many medications are at risk of being made more potent in interaction with grapefruit if they are taken orally, have very low to intermediate intrinsic oral bioavailability, and are metabolized by CYP3A4. Patients aged 45 years and older are at increased risk of grapefruit-drug interactions due to their increased consumption of grapefruit and prescription medications. Elderly patients are most vulnerable because they are less able to compensate for high systemic drug concentrations and because pronounced pharmacokinetic interaction has been found in those 70 years of age and older.

DRUG CLASSIFICATION	DRUG	INNATE ORAL BIOAVAILABILITY*	DOSE-RELATED ADVERSE DRUG EVENT	RISK RANK**
Anti-Cancer Agents				
	Cyclophosphamide	High	Loss of efficacy	Intermediate
	Everolimus	Low	Nephrotoxicity	High
Anti-Diabetic Agents				
	Repaglinide	Intermediate	Hypoglycemia	Intermediate
	Saxagliptin	Intermediate	Hypoglycemia	Intermediate
Anti-infective Agents				
	Erythromycin	Intermediate	Torsade de pointes	High
	Maraviroc	Low	Postural hypotension, syncope	Very high
	Quinine	Intermediate	Torsade de pointes	High
Anti-inflammatory Agents				
	Budesonide (oral)	Intermediate	Hyperglycemia, Cushingoid features	Intermediate
	Methylprednisolone	Intermediate	Hyperglycemia, Cushingoid features	Intermediate
Cardiovascular Agents				
	Amiodarone	Intermediate	Torsade de pointes	High
	Amlodipine	High	Hypotension, peripheral edema	Low
	Apixaban	Intermediate	GI bleeding	High
	Clopidogrel	Very low	Loss of efficacy	High
	Dronedarone	Low	Torsade de pointes	Very High
	Losartan	Intermediate	Loss of efficacy	Intermediate
	Nifedipine	Intermediate	Hypotension, peripheral edema	Intermediate
	Rivaroxaban	High	GI bleeding	Intermediate
	Sildenafil	Intermediate	Hypotension	Intermediate
	Verapamil	Intermediate	Complete heart block	High
CNS Agents				
	Buspirone	Very low	Dizziness, sedation	High
	Carbamazepine	High	Ataxia	Low
	Dextromethorphan	Very low	Hallucinations, somnolence	High
	Diazepam	Low	Sedation	Intermediate
	Lurasidone	Low	Torsade de pointes, orthostatic hypotension, syncope	Very high
	Oxycodone	Intermediate	Respiratory depression	High
	Sertraline	Intermediate	Dizziness, somnolence	Intermediate
	Ziprasidone	Intermediate	Torsade de pointes	High

MOST COMMON DRUG INTERACTIONS

Estrogens				
	Estradiol	Low	Breast cancer risk, thrombosis	Intermediate
	Ethinylestradiol	Intermediate	Breast cancer risk, thrombosis	Intermediate
Immunosuppressant Agents				
	Cyclosporine	Low	Nephrotoxicity	High
	Tacrolimus	Low	Nephrotoxicity	High
Urinary Tract Agents				
	Darifenacin	Low	Urinary retention, constipation	Intermediate
	Solifenacin	High	Torsade de pointes	Intermediate
	Tamsulosin	Intermediate	Postural hypotension, dizziness	Intermediate

*Innate oral drug bioavailability is the population average: very low (<10%), low (>10-30%), intermediate (>30 – 70%), high (>70%)

** Predicted Risk Rank is based initially upon the seriousness of the dose-related adverse drug effect and then adjusted dependent upon the innate oral bioavailability of the drug, which is used to determine the potential magnitude of increase in systemic drug concentration

DRUG-HERBAL SUPPLEMENTS

Many individuals believe that herbal supplements and botanical products found in dietary supplements are safe for human use. Unfortunately, it has been documented that these substances have the potential to interact with prescription, over-the-counter medications, and other dietary supplements. Unfortunately, drug-herbal supplements have not been thoroughly tested, especially in medications with a narrow therapeutic index.

HERBAL SUPPLEMENT	DRUG/DRUG CLASSIFICATION	DRUG EFFECT
Coenzyme Q10	Diltiazem	Decreases blood pressure
Coenzyme Q10	Warfarin	Decreases effect of warfarin
Evening Primrose	Clopidogrel	Increases the risk of bleeding
Evening Primrose	Warfarin	Increases the risk of bleeding
Garlic	Clopidogrel	Increases risk of bleeding
Garlic	Warfarin	Increases risk of bleeding
Ginkgo biloba	Clopidogrel	Increases risk of bleeding
Ginkgo biloba	Warfarin	Increases risk of bleeding
Ginseng	Digoxin	Ginseng can elevate the blood levels of digoxin
Glucosamine	Acetaminophen	Reduces the effectiveness of both glucosamine and acetaminophen
Glucosamine	Warfarin	Increases the effect of warfarin and increases the risk of bleeding
Licorice	Digoxin	Increases the effects of digoxin
Licorice	Warfarin	Decreases the levels of warfarin
Melatonin	Anticoagulants	Increases the risk of bleeding
Melatonin	Anticonvulsants	Increase the frequency of seizures

Melatonin	CNS depressants	Causes an additive sedative effect.
Melatonin	Oral contraceptives	Causes an additive sedative of melatonin
Milk thistle	Diabetes medications	Lowers blood sugar in people who have type 2 diabetes
St John's wort	Alprazolam	Decreases effect of alprazolam
St John's wort	Bupropion	Decreases effect of bupropion
St John's wort	Omeprazole	Reduces the effect of omeprazole
St John's wort	Digoxin	Reduces the effect of digoxin
St John's wort	Oral contraceptives	May result in breakthrough pregnancy or unplanned pregnancy
St John's wort	Phenytoin	May result in loss of seizure control
St John's wort	Simvastatin	Reduces the effect of simvastatin
St John's wort	Warfarin	Reduce the blood clotting effect of warfarin

REDUCING THE RISK OF DRUG INTERACTIONS

Both pharmacists and pharmacy technicians can reduce the risk of drug interactions from occurring in their patients by doing the following in monitoring their patient's therapeutic responses by

- Identifying the patient risk factors, including renal and hepatic function, dietary habits, and social habits, which may contribute to drug interactions.
- Obtaining a thorough patient drug history of their prescription and over-the-counter medications, herbal products, and dietary supplements.

Often drug interactions occur as a result of the pharmacist and pharmacy technician being unaware of medications being prescribed by other healthcare professionals and the patient forgetting to inform them of nonprescription products they are taking.

- Becoming familiar with the primary and secondary actions of the patient's medications.
- Consider therapeutic alternatives, especially when two medications are known to interact when taken simultaneously. When a medication with a similar therapeutic profile is available and possesses fewer drug interactions, it should be utilized.
- Avoiding complex therapeutic regimens, when possible, by minimizing the number of medications the patient is taking. In addition, take into consideration the use of medications requiring less frequent administration, which may help avoid drug interactions involving drug absorption.
- Teaching the patient about the benefits and issues which can occur as a result of their medication therapy. Patients with an understanding of their medication therapy are more likely to adhere to their therapy and are cognizant of issues that may arise from drug-related issues.
- Monitoring a patient's drug therapy helps reduce the possibility of drug interactions developing.

MOST COMMON DRUG INTERACTIONS

TEST

Post Test Instructions: Completion of an online post-test with minimum passing score of 70% is required to be awarded CPE contact hours. To access the online post-test for this program, go to: www.pharmacytechnician.org, select "CE" from the navigation menu and then click on "Online CE"

1. Which of the following may precipitate a patient to experience a drug interaction?

a. Patients adhering to their medication regimen
b. Patients are taking 1-2 medications to treat multiple conditions
c. Patients using multiple physicians to treat their overall health conditions
d. Patients using one pharmacy to fill their prescriptions

2. What effect does tobacco smoke have on a patient taking alprazolam?

a. Decreases the half-life of alprazolam
b. Exerts prothrombotic effects
c. Increases the clearance of alprazolam
d. Increases the plasma concentration of alprazolam

3. Drug absorption is affected by the drug's physicochemical properties, formulation, and route of administration. Which of the following is a process by which a drug is absorbed into the body?

a. Enzyme induction
b. Enterohepatic cycling
c. First pass metabolism
d. Passive diffusion

4. Which term refers to the decrease in hepatic enzyme activity resulting in the reduced metabolism of a medication?

a. Active transport
b. Enzyme inhibition
c. Facilitated passive diffusion
d. Pinocytosis

5. Which of the following medications is classified as an enzyme inhibitor for Cytochrome P450 enzymes?

a. Carbamazepine
b. Ciprofloxacin
c. Phenytoin
d. St John's wort

6. Which of the following is an example of drug potentiation?

a. A patient is prescribed penicillin and probenecid where the probenecid is prolonging the activity of penicillin.
b. A patient being prescribed protamine sulfate to treat an overdose of protamine sulfate
c. A patient being prescribed sulfamethoxazole and trimethoprim in treating pneumonia in a patient diagnosed with AIDS
d. A patient taking both warfarin and aspirin concurrently

7. Which medication if taken with spironolactone will increase potassium levels in the body?

a. Amiodarone
b. Carbamazepine
c. Lisinopril
d. Propranolol

8. Which medication taken with sildenafil may result in hypotension?

a. Lovastatin
b. Nitroglycerin
c. Selegiline
d. Sumatriptan

9. Which medication taken with grapefruit juice may result in hypotension?

a. Amlodipine
b. Losartan
c. Methylprednisolone
d. Saxagliptin

10. Which herbal supplement may increase the risk of bleeding in a patient taking warfarin prophylactically for a stroke?

a. Coenzyme Q10
b. Melatonin
c. Milk thistle
d. St John's wort

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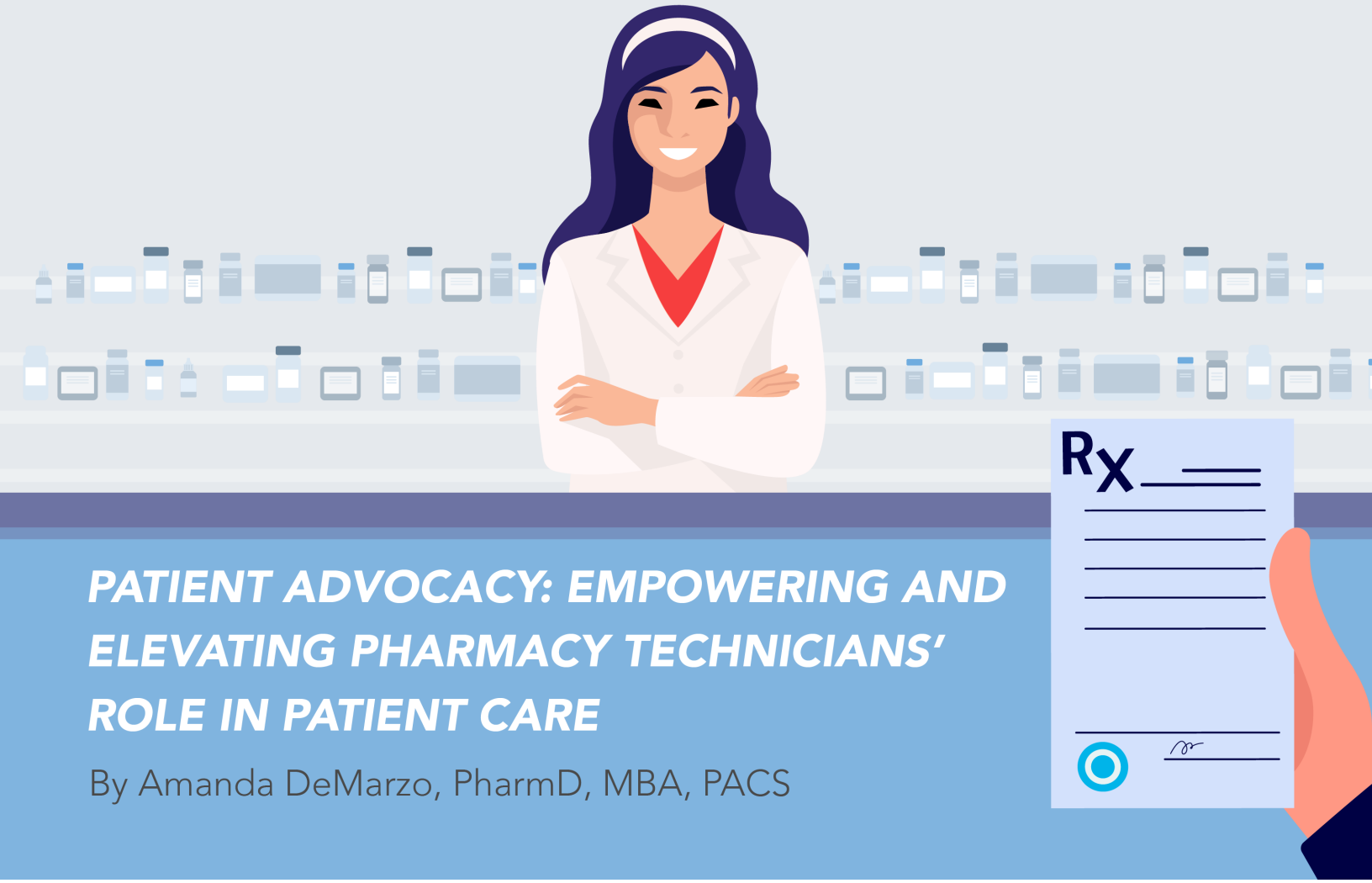

PATIENT ADVOCACY: EMPOWERING AND ELEVATING PHARMACY TECHNICIANS' ROLE IN PATIENT CARE

By Amanda DeMarzo, PharmD, MBA, PACS

Amanda DeMarzo, PharmD, MBA PACS

As Sarah anxiously awaited her turn at the pharmacy counter, her mind raced with worry about her elderly father's complex medication regimen. Her father, Mr. Johnson, had recently been discharged from the hospital, and she had been tasked with picking up his prescriptions and ensuring a smooth transition back home. With a sense of uncertainty, Sarah approached the pharmacy technician, Jenny, seeking guidance and reassurance.

Jenny immediately sensed Sarah's apprehension and stepped into her role as a patient advocate with a warm smile. She carefully reviewed each prescription and checked for coupons and savings. Recognizing how important it is for Mr. Johnson to take his medicine correctly and at the correct times for his well-being, Jenny provided Sarah with practical strategies to help her father stay on track with his medications, including multiple ways to remind him about his medication schedule.

Jenny did more than provide technical advice - she showed genuine compassion and empathy.

She listened attentively to Sarah's concerns and answered all her questions, alleviating her anxiety and instilling confidence in her ability to care for her father. Jenny's support extended beyond that single encounter – she provided Sarah with contact information for the pharmacy, assuring her that she could reach out with any additional concerns or questions. Jenny's dedication and patient advocacy had a profound impact on Sarah and her father's journey. Her expertise, attention to detail, and compassionate approach helped Sarah navigate the complexities of her father's medications with ease. By empowering Sarah with knowledge and support, Jenny made it easier for Sarah's father to take his medication on schedule and reduced the stress and worry often accompanying caring for someone else.

This anecdote underscores the pivotal role of pharmacy technicians as patient advocates. Jenny's commitment to patient-centered care, affordability, medication safety, and effective communication enhanced Sarah's experience and contributed to improved health outcomes for Mr. Johnson. Pharmacy technicians like Jenny have the power to make a lasting difference in patient's lives by providing education, support, and advocacy.

Patient advocacy encompasses a wide range of activities that help patients navigate the healthcare system. It is the practice of actively supporting and safeguarding the rights, interests, and well-being of patients. This includes empowering patients, facilitating informed decision-making, and ensuring their voices are heard throughout the care journey.

The Evolving Role of Pharmacy Technicians

Although patient-centered care is the standard today, this was only sometimes the case. The pharmacy technician profession has undergone significant transformation throughout its history, particularly in the last few years due to the COVID-19 Public Health Emergency. The pharmacy technician role has changed from a primarily supportive role to one with expanded responsibilities that makes vital contributions to the healthcare system. Understanding the evolution of the pharmacy technician profession provides valuable context for appreciating its growth and recognizing the essential role it plays today. During the early days of modern pharmacy practice, the pharmacist was responsible for compounding and dispensing medications. However, during the 1950s, pre-manufactured drug products became more common, and pharmacy practice moved from a soda fountain retail store to pharmacy establishments that more closely resemble today's pharmacies. With this new pharmacy model came other changes: a higher number of dispensed prescriptions, an increased need for record-keeping, and additional counseling responsibilities for pharmacists.

As the demand for pharmacy services increased, the need for additional staffing support was evident. The pharmacy technician role was created to focus on assisting pharmacists in the dispensing of medications and operations of a pharmacy. During this time, pharmacy technicians primarily performed tasks such as preparing medications, counting tablets, and labeling bottles. They also maintained inventory, organized prescriptions, and managed administrative aspects of the pharmacy.

As the healthcare industry continued to evolve, pharmacy technicians continued to take on more responsibility. Some of these tasks include medication compounding, intravenous preparation, and sterile product preparation. This role expansion was driven by advanced technology, increasing demand for these specialized medications, and the industry pushing for improved patient care.

Soon, the desire for specialization and excellence in the pharmacy technician profession led to certification and formal education, elevating the profession. These programs armed technicians with the necessary knowledge and skills to perform their duties accurately and safely. This also carved a path for pharmacy technicians to move from serving a supportive role to becoming integral members of the healthcare team.

In recent years, pharmacy technicians have become pivotal in all pharmacy operations. The role again expanded, now including more direct patient interaction. Pharmacy technicians are currently involved in medication reconciliation, patient calls and assistance, and interfacing with health insurance to help patients gain access to much-needed medications. And in 2020, as the

COVID-19 Public Health Emergency brought national recognition to the profession, overwhelming healthcare needs led to pharmacy technicians taking on even more responsibilities and learning new skill sets, such as providing immunizations.

Pharmacy technicians play a vital role in ensuring safe drug use and contributing to high-quality healthcare delivery. This evolution of the pharmacy technician profession reflects the growing importance of collaborative and patient-centered healthcare.

Suited for Advocacy

With a frontline role, pharmacy technicians are accessible to the public and well-suited for patient advocacy. With an understanding of healthcare, health insurance, and pharmacy operations, pharmacy technicians can help patients navigate some of the most challenging aspects of accessing healthcare. Pharmacy technicians can actively promote patient-centered care by engaging patients in meaningful conversations about their health conditions, medications, and treatment plans.

Through their knowledge and expertise, they can help patients by ensuring they have access to the information they need to make informed decisions about their care. This can include education on health insurance, financial obligations, healthcare processes, prior authorizations, and other administrative challenges. Pharmacy technicians actively help patients start their medications by communicating with insurance companies, coordinating care with physicians, and registering patients for discounted drug programs.

Additionally, pharmacy technicians can play a crucial role in promoting medication safety. They must fill prescriptions carefully and attentively to ensure the correct medication is going to the right patient. They collaborate closely with pharmacists to prevent medication errors and offer medication counseling to patients. They are the liaison between the pharmacist and patient, and in some cases, speak up for patients who may want to counsel but don't want to "bother the pharmacist." This enables safer medication use by the patient and encourages and empowers the patient to learn more and take an active role in their healthcare. By advocating for safe medication practices, pharmacy technicians contribute to improved patient outcomes and overall healthcare quality.

Most importantly, pharmacy technicians often serve as a vital link between patients and healthcare providers. They listen attentively to patients' concerns, offer guidance and support, and serve as advocates for their well-being. Through their empathetic approach, they can help patients feel heard, respected, and valued. Pharmacy technicians can foster a trusting relationship that positively impacts a patient's healthcare experience.

Speaking Up for the Underserved

In the dynamic landscape of healthcare, pharmacy technicians play an essential role as patient advocates, ensuring that the needs and rights of patients are upheld. For many underserved individuals, accessing quality healthcare is filled with challenges, from health literacy barriers to social disparities. Armed with their expertise and compassion, pharmacy technicians can bridge these gaps, empowering the underserved through education, support, and the promotion of social equity.

Health literacy is the ability of a person to comprehend and apply health information when making appropriate health decisions. It is a crucial factor in patients' ability to make informed decisions about their health and well-being. Unfortunately, over 77 million Americans have attempted to use health services, obtain quality care, and maintain healthy behaviors due to limited health literacy. It was found that nearly 36 percent of adults in the United States have low health literacy, with a disproportionate number found among lower-income Americans eligible for federal health programs. Limited health literacy can lead to misunderstandings surrounding healthcare, including errors in following treatment instructions, poor adherence to medications, and delays in seeking appropriate care. In addition to possibly receiving low-quality care, adults with low health literacy may experience higher healthcare costs, more extended hospital stays, and more hospital visits.

Through direct interactions with patients, pharmacy technicians have a unique opportunity to identify patients who may be experiencing challenges with health literacy and help address these challenges to improve patient outcomes. For example, pharmacy technicians can employ clear and simple language, visual aids, and patient education materials to convey important health information successfully. Pharmacy technicians can also collaborate with pharmacists and other healthcare professionals. Not only can they work together to enhance patient comprehension, but they also create educational programs and initiatives that specifically address health literacy in their communities. By being proactive, pharmacy technicians can contribute to breaking down barriers that limit the understanding of healthcare information and ultimately restrict patient access.

Addressing Health Disparities

In the United States, there is an increasing need for healthcare professionals to focus on social determinants of health. Health disparities stem from factors such as income, race, ethnicity, and geographic location and can heavily influence healthcare access and outcomes for underserved populations. As a healthcare team member who interacts with the community every day, pharmacy technicians are on the front lines of these disparities and witness the challenges faced by patients who struggle to access necessary healthcare.

As patient advocates, pharmacy technicians can play a pivotal role in addressing social disparities by actively advocating for health equity within the healthcare system. They can engage in conversations with patients to understand their unique challenges and needs, fostering an environment of trust and respect. By doing so, pharmacy technicians empower patients to share their experiences and perspectives, helping to identify systemic issues that may hinder equitable care.

Pharmacy technicians can also work within the community to promote social equity. By spearheading programs and initiatives within their scope, pharmacy technicians can make a difference for underserved patients. For example, a pharmacy technician can work with their pharmacy team to offer a vaccine clinic and promote the event in the language many members of the

community speak. Additionally, partnering with healthcare organizations, community groups, and policymakers can expand impact and make a difference for social equity in larger communities.

The Future of Healthcare, Pharmacy, and Advocacy

Today, healthcare in the United States is more complex than ever, with many contributing factors and motivations. Healthcare costs continue to rise, and the money seems to be going toward administrative functions and intermediaries rather than direct patient care. Patients are unlikely to understand these intricacies of pharmacoeconomics or how money flows through the healthcare system. This means patients may not know who is responsible for their health coverage, often blaming pharmacy staff for the cost of their medications. For example, patients often don't know what a Pharmacy Benefit Manager is and how they are responsible for determining the drugs that will be paid for through the plan's formulary. This demonstrates the importance of having a knowledgeable and accessible care team to create transparency in this opaque system.

In recent years, physician reimbursements - or payment for services - have also decreased. Therefore, physicians have been pressured to see more patients in a single day, often cutting appointments shorter. As a result of this time constraint, it's highly probable that patients are missing out on opportunities to ask questions and feel comfortable with their care.

Unfortunately, patients are often left to their own devices - figuratively and literally - to learn more about their health needs or the process of getting their medications. Patients are likely searching the internet to learn about their health or their challenges with healthcare but may be getting inaccurate information from unreliable sources.

Often, many patients are looking for healthcare professionals who can assist them. Subsequently, this leaves an opportunity for pharmacy professionals, such as pharmacy technicians, to fill the gap that is being created by volume-based healthcare. In the changing healthcare landscape, healthcare professionals are often faced with fewer resources than ever before. Regularly, news reports on nurse shortages, high nurse-to-patient ratios at hospitals, pharmacist vacancies, and healthcare providers leaving the profession. As a result, this places pressure on the entire system - but it has also been an opportunity for existing professionals to take on additional responsibilities.

Recently, pharmacy technicians have been elevated to expanded roles that have previously been fulfilled by nurses or pharmacists with the development of advanced certifications. As the country continues to face the repercussions of an overwhelmed healthcare system, these trends for advanced certifications and expanded pharmacy technician roles are likely to continue.

The increasing responsibility and scope set a high standard for the pharmacy technician profession. Striving for excellence includes prioritizing patient-centered care and patient advocacy – ensuring that patients get the care they need and deserve. With this focus, pharmacy technicians can and will be at the forefront of the future of healthcare.

Going Above and Beyond for Patients

Ultimately, pharmacy technicians possess the unique opportunity to be patient advocates, going beyond their technical roles to provide compassionate support, education, and empowerment. By actively engaging patients, promoting medication safety, and serving as a bridge between patients, healthcare providers, and insurance companies, pharmacy technicians can contribute significantly to patient-centered care and the overall well-being of individuals seeking healthcare services.

Unifying as patient advocates, pharmacy technicians possess the capacity to drive positive change in the healthcare landscape. By embracing this role wholeheartedly, we can uplift patients and lead them to a healthier and happier life. Let's come together and make patient-centered care and advocacy integral to our pharmacy practice, creating a lasting impact on the well-being of our communities.

CPhT CONNECT™

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WITH MIKE JOHNSTON, CPhT-Adv

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MEMBER SPOTLIGHT

Yvonne Fairbanks CPhT-ADV,

"NPTA stands out from other associations by offering hands-on, in-person training courses such as this for pharmacy professionals to attend. "

YVONNE FAIRBANKS

I was born and raised in Sacramento, CA. I was an athlete and played softball and club volleyball throughout my youth. I currently play on a women's volleyball team and a mixed bowling team. I am also a certified Group Fitness Instructor and used to teach cardio kickboxing and weight lifting classes. I have always been interested in cars, so when I purchased my Mustang GT in 2020, I joined a car club and learned how to modify my car. I have been married to my husband (Adam) since 2011 and have a 22-year-old stepson (Austin) and a Chihuahua (Gunnar). Sacramento Kings, San Francisco Giants, and Houston Texans are my sports teams. I also have seven tattoos and am looking forward to getting my entire left arm sleeved in Japanese flowers.

WHEN DID YOU FIRST BECOME INTERESTED IN BECOMING A PHARMACY TECHNICIAN?

I knew that I had a natural curiosity surrounding medicine for one reason. My father passed away from AIDS in 2005, and I remember going through his medicine cabinet and secretly researching his medications to discover what they were, what they did, how they worked together, why they were important, etc. I didn't know how I could be a part of someone's recovery or health journey, but I knew I wanted to help people.

TELL US ABOUT YOUR CURRENT POSITION/CAREER.

I am a Pharmacy Technician Supervisor at UC Davis Medical Center in Sacramento, CA. UCDMC is the #1 hospital in Northern California and has the only level 1 trauma center and level 4 NICU. Licensed for 646 beds and a census constantly hovering around 700+, I have approximately 100 technicians that I help to oversee in our Inpatient Central Pharmacy. I am responsible for the sterile and nonsterile areas of Central Pharmacy and ensuring that the staff working in those spaces follow all rules and regulations set forth by the CA Board of Pharmacy, USP 797, TJC (The Joint Commission) and CDPH (California Department of Public Health). My job is to ensure that all staff is trained on proper compounding, cleaning, and documentation procedures. I am also responsible for maintaining the stock of supplies and assisting with managing shortages. The best part of my job is being able to help technicians grow and get to where they want to go within their careers. The worst part is having to be the bad guy. Being a supervisor is not for the faint of heart. It takes someone with thick skin that doesn't take things personally. Even as a supervisor, you can make many friends and have loyal technicians, but some will always see you as the enemy. It's all about how you treat your staff. I treat my staff like equals because I know I am not better than anyone. If you show them respect, they will respect you in return.

CSPT, BCNCPT

WHAT WAS THE EDUCATIONAL PROCESS YOU TOOK TO GET WHERE YOU ARE TODAY?

As an athlete growing up, I thought I would continue that path and initially enrolled in my local junior college to be an Athletic Trainer. I quickly learned that quite a few people wanted to be in that field, which was difficult for women to break into. I became frustrated with the time frame when I could not get the classes I needed, so I changed my major to Geography. Again, I was interested in it, but I didn't have the classes I needed when I was available as I had a full-time job. I continued to change my major to other things that captured my interest until my brother called me out one day by saying, "When are you going to pick something and stick to it? You never finish anything."

I decided to enroll in a local allied health school and stop chasing classes at the junior college. At the time, I didn't know anything about pharmacy and was looking at doing an ultrasound, but that required a BA/BS degree or previous completion of an allied health program. After taking the necessary enrollment tests, I talked to one of the counselors, and they suggested pharmacy technology. I went home with the pamphlets and spoke to my husband to discuss the pros and cons.

WHAT ADVICE DO YOU HAVE FOR TECHNICIANS WHO FEEL TRAPPED OR IN A RUT IN THEIR CURRENT POSITION?

I was this person in 2017-2018. Before being a supervisor, I felt like I was in a position where I couldn't learn anything else unless I became a pharmacist. I was already looking into returning to school to get a degree in Clinical Nutrition. I enjoyed my position as an IV/Chemo technician and liked to get out now and then to deliver medications to the nurses throughout the hospital. Still, I assumed this was all there was in the inpatient environment. What I learned is that you are limited to yourself and your environment. I looked outside of my environment and found my current position. Since I've been in my current position, I learned that there are so many more positions that pharmacy technicians can do other than the typical inpatient and retail jobs. The one catch? Educate yourself. Read everything you can. Get certifications that interest you. Volunteer your time to gain experience. If you genuinely love what you do in pharmacy, but want a change, BE the change in your life and advocate for yourself. Don't let anyone discourage you from gaining an education, as this will only help you further your career.

WHAT ADVICE WOULD YOU GIVE TO A STUDENT OR BRAND NEW TECHNICIAN?

Get your CPhT. Don't pass go, don't collect $200, get your CPhT. The information will be freshest in your mind, and the test will be the easiest it will ever be. Once you start working, be open to feedback and do not take it negatively. You must remember that you are new to this career, and there are many ways to do the same task. Do not be afraid to ask questions – even if it's the same question and you need clarification. In medicine, it's better to ask questions than to assume. An assumption could be the difference between the life and death of a patient.

WHAT IMPACT HAS NPTA HAD ON YOUR PROFESSIONAL CAREER?

I am a member of ASHP, CSHP (California Society of Health-System Pharmacists), PTEL {(Pharmacy Technician Executive Leadership Committee) - part of CSHP} and have been able to be a part of community forums lobbying to shape the scope of pharmacy technicians' responsibilities within the state of California. I am certified through PTCB, BPTS, and WSPA (Washington State Pharmacy Association). Having an association like NPTA has helped my career by establishing me as a leader within my entire hospital by training me to be 1 of 2 certified in nonsterile compounding. NPTA stands out from other associations by offering hands-on, in-person training courses for pharmacy professionals to attend.

ARE YOU READY TO ADVANCE YOUR CAREER?

WE'VE GOT ALL THE ESSENTIALS.

NPTA's new initiative, BPTS, is designed to help you advance in your career. The goal with BPTS is to help 1,000 CPhTs earn their CPhT-Adv by the end of 2023! All ten of the essential training certificate programs for the pharmacy technician profession are offered through BPTS.

NPTA National Pharmacy Technician Association

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