PRESCRIPTION & OTC DRUGS: MISUSE & ABUSE

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Physicians write more than 3 billion prescriptions for drugs each year just in the United States. That's an average of 10 prescriptions for every man woman and child. More than \$154 billion are spent annually on those prescriptions. Another \$20 billion are spent on over-the-counter drugs, while several billion dollars more are spent on herbal medications and dietary supplements.

To complicate this picture, any of these drugs—prescription, OTC, or herbal—can be misused, causing physical or mental problems. The misuse can be accidental often due to lack of sufficient knowledge on the part of the patient. The misuse can be deliberate; last year almost 11 million people in the United States abused prescription drugs, for nonmedical reasons.

Sammy: "1,000 milligrams of Seroquel[®] and 1,500 milligrams of Zoloft[®]. I took them all at once because I was so depressed. My fiancée and I had a fight and I wanted to kill myself."

This video will examine the pharmacology of prescription, OTC, and herbal medications while analyzing the dangers of misuse and abuse.

WHAT IS A DRUG?

A drug is defined as any substance used in the prevention or treatment of a disease or condition. A drug can come in a natural form, it can be refined from a natural source, or it can be synthesized. And although many medications originally came from natural sources, today most of them, except herbal medications, are synthesized.

Interestingly the only difference between some OTCs and prescription drugs is the concentration of the active ingredients. For example, prescription Motrin[®] contains 400–800 milligrams of Ibuprofen[®] while the over-the-counter version contains only 200 milligrams.

MEDICINE OR POISON?

Zane Horowitz, MD, toxicologist: "The father of toxicology Paracelsus once said that all things are poison, the only thing that separates a therapeutic agent from a poison is the dose."

ER physician: "What did you take?" Patient: "Handful of Tylenol[®]." ER Physician: "Tylenol[®]. Anything else?"

Despite the fact that street drugs like ecstasy, methamphetamine, heroin, marijuana, and cocaine have gotten most of the headlines, almost as many people end up in emergency rooms from adverse reactions to legal drugs.

Paul Rostykus, MD: "Probably Tylenol[®] is the most common one. Other things we see . . . antihistamines which primarily make people drowsy. The other one would be alcohol often combined with some other sedative, some other benzodiazepine which is either a sleeping medicine, or a

tranquilizer, anxiety medication."

The therapeutic index of a drug measures the difference between an effective dose and a toxic dose. This margin of safety can be narrow or wide.

For example, Coumadin[®], an anticoagulant, has a narrow margin of safety. Small changes in dosage could cause internal bleeding, and possibly cause the patient to pass out.

Prilosec[®], used to treat acid reflux disease, has a wide margin of safety. Two or three times a normal dose is less likely to cause negative side effects. Over-the-counter-drugs and herbal medications in general have moderate-to-wide margins of safety although some can be dangerous.

OVERUSE

Most of the problems with legal drugs occur because of overuse. For example, too many stimulants can cause the heart to beat uncontrollably; too many steroids can dissolve bone and lead to fractures.

Zane Horowitz, MD, toxicologist: "But overall, the medications that cause the largest group of problems are cardiovascular agents."

For example, Digoxin[®] is used to strengthen heart muscle contractions but just a few times the prescribed dose can cause heart arrhythmias. A final example is ephedrine, a plant extract with cardiovascular effects that is found in the ephedra plant.

Don Yance, herbalist: "The dosage of ephedrine is very very key. A very tiny amount is virtually harmless to the body where the misuse of it, taking very high amounts, can be very problematic— accelerate the heart rate, cause dehydration, and that is where the problem is, the misuse."

Because of a number of deaths from overuse of ephedrine, the Food and Drug Administration banned the substance in December of 2003.

PATIENT COMPLIANCE

Besides taking too much, patients can also misread or ignore directions on the prescription bottle.

Pete: "The doctor told me that if I was playing with my medication, to don't play with it because it ain't no joke. You know he told me always take both of them, don't take one by itself because he said, 'You'll hurt yourself, seriously hurt yourself."

Not taking the drug at the prescribed times is a major problem with all medications. The patient who skips a daily dose or takes it at irregular times negates the potential benefit. This is particularly true with psychiatric medications.

Val: "There was one time that I didn't take my medicine for 9 days. Like I was hearing voices and stuff like that pretty much. Paranoia and stuff, mood swings. And you know it wasn't very good."

Client: "So I was taking 3 - 150s." Pablo Stewart, MD: "Oh yes I remember. That was a little high. I don't know if we can go up that high again."

Physician's need to monitor patients' reactions to medications, to adjust the dose, or even stop the drug when side effects are too damaging, or when it simply isn't working.

Frank: "There is no way for the doctor to really know the effect that it is having or if it is working or not unless I tell him. So I am always, if I feel like I need to give feed back or if I am going through a

particularly bad time, I keep my doctor abreast of those things."

Pablo Stewart, MD: "We are now running into the case where people are being prescribed multiple medications often by multiple providers. So if a person goes to one doctor and gets this type of medicine and goes to another and gets this which is just a formula for disaster because it is often difficult for the same doctor to monitor all the potential reactions between 2 meds."

POLYDRUG USE

Pharmacist to client: "It's important not to miss a dose of that. It's not a drug you abruptly stop taking."

Besides overuse, patient compliance problems and monitoring patient's reactions—cross-reactions with other drugs and substances—can also cause health problems. For example, St. John's Wort lowers the effectiveness of oral contraceptives. It also reduces the effectiveness of Crixivan[®], an AIDS drug, by more than half. Aspirin, and naprosyn (Aleve[®]) when taken with prescription blood thinners will increase the risk of bleeding.

Viagra[®], a drug that helps treat sexual dysfunction by manipulating blood flow, should be avoided in those with cardiovascular problems particularly if they use nitroglycerin or other heart medications.

Gloria Elder, RPh: "There's a lot of interactions between prescription drugs and herbal products. More and more data is coming out about it because of the resurgence of interest in the herbal drugs but a lot of the data isn't there."

One should never assume that any medication, either prescription, over-the-counter, or herbal, can be mixed with another without specifically asking a pharmacist or a physician.

Sally: "Anytime I take any over-the-counter products or anything, I always call him, I always call my pharmacist. And they are really helpful. And they know. They know me, they know my condition, they know everything."

Four factors—absorption, distribution, metabolism, and elimination—determine the speed, intensity, and duration of a drug's action.

ABSORPTION

The way a drug is absorbed into the bloodstream governs the concentration of the drug and how rapidly it begins to work.

- A drug can be inhaled and absorbed through the lungs, the fastest route of administration;
- it can be injected into a vein, under the skin, or into a muscle, the next fastest route.
- A drug can be absorbed through a mucous membrane;
- or through the skin, the slowest route of administration.
- But the most common means of drug use is orally.

Whether swallowed as a liquid, capsule, tablet, or powder, it enters the digestive tract. It normally takes 15 to 20 minutes for the drug to enter the blood via the capillaries in the lining of the small intestines. It is here that most of the absorption takes place, not in the stomach. Only the IV route guarantees that all of the drug that is taken actually makes it into the bloodstream. With the other routes of administration, the bioavailability, or the amount of the drug that actually reaches the bloodstream, is less.

DISTRIBUTION

Once the drug is in the bloodstream it needs to reach its target and since blood cells reach every tissue in the body, so will the drug. So there will always be unintended and unwanted effects especially if the drug is abused.

METABOLISM

The liver is the main metabolizing organ of the body. Each minute over 1 liter of drug-filled blood is infused through the liver from the portal vein. Most of it comes from the small intestines, where oral medications are absorbed. Recirculated blood from the heart also enters the liver through the hepatic artery continuing the metabolism and elimination processes.

The liver neutralizes a drug into weaker metabolites and other chemical byproducts of the original substance. These metabolites and waste products are eliminated from the body through urine and sweat.

Pablo Stewart, MD: "Every medication is potentially liver toxic, hepatotoxic. Certain meds are more hepatotoxic than others. For example, the antidepressant Serzone[®] is found to be extremely liver toxic, so you would avoid that in patients that have any liver problems."

A healthy liver efficiently neutralizes drugs. A liver compromised with jaundice, hepatitis, or inflammation can not efficiently do this.

Sally: "I have hepatitis C. And I wouldn't accept that as a disease. I just thought that it was a little problem I had. So what I did know that they told me, whatever I do don't take Tylenol[®] because I already have a very delicate liver and I can't take any more stress."

Although the liver can metabolize more than one substance at a time, when alcohol and another depressant are taken together they compete for the same enzymes, and problems can occur. The alcohol takes precedence, so the second drug is not immediately metabolized and circulates through the body at full strength. This polydrug reaction will slow down respiration and decrease the heart rate. Depending on the dose and the patient's health, blackouts, coma, or death can occur.

Val: "I'd drink alcohol with some of these pills that I was taking and I would really just, I would blackout. I would loose consciousness and pass out."

Synergistic effects can occur with a combination of an opioid and a sedative-hypnotic, not just with alcohol.

Joan: "Yeah, I found that when I took the Xanax[®] with the opioids or pain killers I got a huge buzz. And I used them too much, so that I blacked out at times."

ELIMINATION

As the drugs and their metabolites circulate, they enter the kidneys through the renal arteries and are eliminated. Since the kidneys are the main excretory organs, overuse of certain drugs can cause damage.

Felice: "My kidneys weren't working; my blood was all out of whack. I was lethargic, my skin turned yellow, I was very very sick."

Paul Rostykus, MD: "Drugs that are potentially toxic to the kidney would include all of the nonsteroidal anti-inflammatory drugs. That's like Ibuprofen[®], Motrin[®] others like Naprosyn[®]—fairly commonly prescribed, often over-the-counter drugs. They have potential for causing kidney damage or kidney failure, usually reversible."

PSYCHOACTIVE DRUGS

John: "We went to the emergency room. We had it x-rayed. They gave me morphine and some other

stuff."

The group of drugs that seems to have the most side effects and cause the most problems are psychoactive drugs, drugs that cause mental and emotional effects as well as physical effects. These substances work on the mind because, unlike many other drugs, they cross from the blood stream through the tightly packed cells of the blood-brain barrier and act on the central nervous system, the brain and spinal cord.

The major groups of legal psychoactive drugs are depressants, stimulants, and psychiatric medications.

DEPRESSANTS: OPIATES

The most widely used and often abused class of depressants are called "opiates and opioids." These narcotics are refinements or synthetic versions of the opium poppy. They are mainly used for the relief of acute pain and to help the patient function.

John Maurer, MD: "The use of narcotics has got to lead to an enhancement in the quality of life otherwise there is no point. It is not an escape route to sitting around in your underwear watching the tube."

Bob: "It has to do with whether you want to just veg out and not know anything and not feel. If you take too much you forget what day it is. What I am really trying to do is to just take enough that it takes the edge off so that you can survive."

Opiates can cause problems because of drug-body interactions especially tolerance, dependence, and withdrawal.

TOLERANCE

The development of tolerance to an opiate analgesic causes a drug user to need more and more of the drug to achieve the same desired painkilling effect. Once a threshold dose is crossed through continuous overuse, the development of tolerance accelerates.

Phil: "It started with the Vicodin[®]. I'd take a couple. I'd take 2 and see how it would feel. I would feel a little buzz. And then I'd, eventually I'd end up taking 5. I'd be like, this is pointless; Percocet[®] is 2 Vicodin[®]; so then I moved up to Percocet[®], take 2 or 3 of those then you feel it, and then OxyContin[®]."

Part of the problem with opiates is that besides controlling physical pain, the drugs can subdue emotional pain and even create a euphoria. Because tolerance to the emotional effects develops more quickly than to the painkilling effects, an abuser can dangerously depress their respiration and heart rates.

Roger: "The most frightening time was on a narcotic. I didn't feel anything, I didn't feel anything and anyway, the next thing my wife wakes up next to me and I am gurgling, and gray, and bubbling at the mouth."

TISSUE DEPENDENCE

When a person uses a drug over time, the body and brain actually change and adapt to what it considers a toxin. With opiates, one of the changes causes the body to stop producing as many of its own natural painkillers called "endorphins," and in general it makes the body function abnormally, dependent on the substance to stay in balance.

Katherine: "I was supposed to take 5 a day, 1 every 4 to 6 hours. Well it got to the point where I would just pop all 5 at once. I had given them to my significant other to control them for me but I found myself

lying and manipulating to get all 5 at once."

WITHDRAWAL

Once the body has adapted to the drugged state and use is abruptly stopped, withdrawal effects set in. All the neurochemical and physical reactions that were suppressed while taking the drug kick in.

Keith: "I could take up to 8, 80 milligram OxyContins[®] at a time at the end. And that would last for about 5 hours and then I would go into withdrawal, which would be just like doing heroin. And I'd become very depressed, suicidal, my skin would itch, I would ache to the bone."

Laurie Partridge, RN (to patient): "You've been taking some Vicodin[®]. With the Vicodin[®] you've been having some vomiting because of the withdrawal symptoms with that. And with the withdrawal, you'll be having some anxiety that's a result of coming off the opiates."

Withdrawal from long-term use of any medication that has mental effects must be done gradually with the help of a physician since these effects can be dangerous and sometimes require hospitalization.

Laurie Partridge, RN (to patient): "It looks like on the top roof of your mouth, your soft palate is yellow and that's a sign, one of the first signs, that you have some impaired liver function."

Withdrawal effects occur with most psychoactive drugs to one degree or another.

Veronica: "When I was going through my withdrawal, my 18-year-old son had to lay on top of me on my bed because I was shaking uncontrollably and he laid there and cried and said, 'Mom, please don't die.""

ADDICTION

Katherine: "I was on Vicodin[®] extra strength and I went to the doctor, and I said—my neurosurgeon and I said, 'I am becoming addicted. I need help. I want off of these drugs. I want to deal with it!' 'No, you need to be on something,' so he switched me to OxyContin[®], which was an absolute nightmare. You only take 1 every 12 hours but I went absolutely crazy. Ended up on 2 North at Rogue Valley Medical Center to be weaned off of the OxyContin[®]."

Addiction is a medical condition characterized by the development of tolerance, tissue dependence, and withdrawal, coupled with the user's continued use despite negative consequences and loss of control over use.

Roger: "I would chew them because I wanted a quicker effect. I would actually, literally chew them in my mouth, you know, 4 or 5 of them, and swallow them down with water. That way I could get the effects within about 5–10 minutes."

One current example of prescription abuse and addiction is the popularity of OxyContin[®]. Addicts will abuse this time-release medication by crushing them to release all of the drug's potency at one time.

Gloria Elder, RPh: "They ruin the time-release quality of the product, so instead of OxyContin[®] 20 milligrams that's designed to give 20 milligrams over a 12-hour period, you're going to get 20 milligrams in a blast. And that's what's being abused. And it is unfortunate because when a doctor feels that that's a good product for someone and the press is out there saying that it's a dangerous drug, they're resistant to take it."

Jerry Clarke: "Another drug that has problems is methadone. Methadone is a wonderful pain reliever; however one of the side effects is addiction. For those that are predisposed to addiction already and might be complicated by chronic pain, their physician, or pain management specialist, or their pain clinic might give them methadone and as the addict begins to use methadone for pain relief, addiction sets in. Higher levels are then prescribed because of tolerance."

DEPRESSANTS: SEDATIVE-HYPNOTICS

Sedative-hypnotics, another class of depressants, are used for the relief of stress, to induce sleep, and sometimes to ease muscular-skeletal pain or to prevent withdrawal seizures. They include the benzodiazepines, particularly Xanax[®], Klonopin[®], Valium[®], and Halcion[®] along with a few barbiturates.

Joan: "He gave me a phenomenal amount of Xanax[®] and I would just take those. And I would take 4 or 5 at a time and black out and when I would wake up, I would go right back to taking that amount. And I would run out and he would refill the prescription."

Pablo Stewart, MD: "People get physical dependence on these, meaning if they stop the medication, they can go into a potentially life-threatening withdrawal from benzodiazepines. So given that situation, benzodiazepines really do not have a chronic indication, meaning there is no medical or psychiatric condition that would warrant them being used over the long haul."

Veronica: "When I was going through my withdrawal, my 18-year-old son had to lay on top of me on my bed because I was shaking uncontrollably and he laid there and cried and said, 'Mom, please don't die.""

DEPRESSANTS: SKELETAL-MUSCLE RELAXANTS

Another group of prescription depressants are skeletal muscle relaxants aimed at relieving muscular pain. There has been an increase in the abuse of these drugs and a number of deaths have occurred.

Abby: "I abused Soma to the point of the doctor finally getting it, that something was wrong. I wasn't just having legitimate pain and they knew and the office clerks knew. I could function on it to some degree. I just wanted to get out of mental anguish."

John Maurer, MD: "Soma is largely a tranquilizer. I mean it becomes a tranquilizer and perhaps some people, that's what they need because of the psychological dynamics that are going along with their chronic pain. Remember, chronic pain doesn't happen in a vacuum. You're dealing with complex issues. And some of those may be need to be treated with psychotropic drugs."

STIMULANTS

Prescription stimulants are amphetamines or amphetamine congeners used to treat attention-deficit disorder, narcolepsy, and obesity.

Edgar: "Years ago the doctor prescribed for me diet pills and they made me lose weight for a while and they made me feel real good, but then after a while my heart started to beat real fast and it skipped beats and I found out later they were amphetamines. After they were banned I switched to some of the over-the-counter stuff they were selling that contained caffeine and other stimulants. Same thing happened, heart started beating faster because I was using too many of them."

Prescription and illegal stimulants are popular on college campuses, mostly for those who want to study long hours.

Quentin: "Adderall is probably the biggest drug I see abused at school, even more so than alcohol because it's used almost on a daily basis for some students who don't wake up until 2 o'clock in the afternoon and stay up all night."

PSYCHIATRIC MEDICATIONS

The most rapidly growing class of psychoactive substances, psychiatric medications, are used to treat

mental illnesses such as depression, bipolar disorders, schizophrenia, and anxiety disorders. This class of drugs mainly include antidepressants, antipsychotics, and antianxiety drugs.

Sherman: "I can accomplish things again. I am comfortable with my life style no matter what it might be. I am OK with it. I didn't think about getting on psych meds all my whole life until 4–5 years ago. I have to applaud psych meds compared to the street drugs."

The most popular of these drugs are the antidepressants, especially the newer ones known as "SSRIs" or "selective serotonin reuptake inhibitors." When the SSRIs block the reabsorption of serotonin, this increases the amount that can interact with the receiving neuron. This stimulation of serotonergic activity counteracts depression.

Frank: "Well the Paxil[®] really does help, how shall I say, give me emotional equilibrium. It helps to check the depression I was suffering from. And as a result I am able to get more done than I would normally be able to."

Unfortunately a number of drugs also increase serotonin; so when 2 or more of these drugs are used, a saturation of this neurotransmitter can cause serotonin syndrome.

Zane Horowitz, MD, toxicologist: "In the mildest form of serotonin syndrome, patients may start taking the drug and after a week or so find themselves to be more confused than they were beforehand. Find themselves with a tremor, making them think they are having some sort of anxiety component where really it is a drug induced tremor. And then some sort of problem, let's say like diarrhea or profuse sweating, that they can't understand why they are having. And that would be considered a mild form of serotonin excess."

OVER-THE-COUNTER DRUGS

Just as prescription drugs have a therapeutic dose and potential side effects, so do over the counter drugs. Sometimes these drugs are intentionally misused.

Judy: "I was taking Benadryl[®]. You take a whole packet of like Benadryl[®] allergies stuff and like you trip."

Phil: "When I was doing it sometimes, I'd get a little stinging pain right here and it was all just all bad. I knew it was my liver from all the pills and all that."

When it comes to herbal medications, it is crucial to remember that because a substance is found in a plant or an animal doesn't make it natural to the human biological system and they can still have toxic properties.

Besides abuse of diet aids and OTC stimulants, a current popular drug is dextromethorphan, often taken at 3 to 10 times the normal dose.

Zane Horowitz, MD: "It actually has a mild narcotic effect and then a sort of a dysphoric or pleasant effect. And we've seen cases where kids have gone out and it is called 'skittles' on the street because they look like skittles candy, those red tablets. And they will take these and they will take 5 or 6 of these, or 8 or these, or a box of these and they will be found not breathing."

Judy: "And sometimes it is really hard to breathe when you are on it. You're just like you can't breathe and that sucks."

Dan: "I was just puking and puking like constantly and I thought that I was going to die. I don't know why, even though every time I took so many pills, I felt like I was going to die. Like I kept doing it. I don't know, I guess it was addicting."

DRUG DIVERSION

Most frequently, addiction causes people to seek drugs through any means possible.

Joan: "I would use two or three different pharmacies so that they wouldn't catch on to my drug abuse. But at one time I think that the most doctors I went to was four different doctors and they were all prescribing me narcotics."

John Maurer, MD: "If this person truly wants drugs, they're going to get the drugs. I'm not a policeman, I'm a patient's advocate. I can see through people in time and most people I can see through on the first time."

Veronica: "I found myself going in for surgeries, I would think up surgeries to go in and have just so I could get the medication. And I would start with the morphine then drip down to Demerol[®], then we'd go to Percocet[®], and then we'd go to Vicodin[®]. They tried to take me off of things. It was like, 'How dare you?' That is when I started running my scams, and seeing other doctors, and hitting the emergency rooms. One year I actually ended up spending about \$35,000 on prescriptions, and doctor bills, and emergency rooms."

Drug abusers and addicts steal prescription blanks and forge prescriptions—a felony in most states.

Felice: "I'd write my own prescription. He'd write one and I'd take 5 or 6 while he was out doing something and I would take 5 or 6 and then he would write me one that I could forge his signature."

Drug abusers smuggle drugs from Mexico, buy drugs on the internet, or take them from other people's medicine cabinets.

Keith: "When you go to somebody's home, a new home, when you hit the bathroom, believe me, you are opening the cabinets to see what's there. You want to see what pills are there and you'll take them."

SPECIAL POPULATIONS

Certain groups seem to have more problems with prescription and OTC drugs than others. Older Americans have problems because they are prescribed more drugs than any other group and their health may not be as robust as younger drug users.

Gloria Elder, RPh: "The geriatric population is where I probably see more cost savings attempts than anywhere else—like taking half a tablet every day instead of the whole table or not taking it at all, or every other day—not getting their therapeutic effect from it. They're taking it sometimes. They simply can't afford it."

Zane Horowitz, MD: "But not uncommonly we get an ambulance bringing an elderly person to the emergency room in what we call the "brown bag syndrome." They have a big shopping bag with medications and we dump it out on the counter and there's 20 to 30 different mediations mixed in with herbal preparations, mixed in with vitamins, mixed in with other people's medication. Prescription bottles that are 5, 10 years old and you are not sure what they're taking."

Pregnant women have a problem, first because the pregnancy changes their metabolism and aggravates certain health conditions, especially diabetes and blood pressure, and second because almost any drug they take will cross the placental barrier and affect the fetus.

Josie: "Anything with any stimulants such as caffeine, or ephedrine, or ginseng, or anything with the energy boosters we're also supposed to avoid because that tends to bring up the baby's heart rate especially if you take a lot of it."

Adolescents and young adults have problems with prescription and OTC medications because their various systems are not fully developed and they can have exaggerated reactions to various drugs.

Diane Williams, MD: "For instance, children who have disorders such as depression or attention-deficit disorder, we are using a lot more medications than we ever used before. I think the first and foremost aspect is to be sure the diagnosis is correct and that's not easy."

In addition, young people are often not as careful when they buy and use synthetic and herbal OTC medications without consulting a pharmacist, herbalist, physician, or parent.

Recovering addicts in particular have problems because many drugs that are prescribed can trigger craving and interfere with their recovery.

Felice: "I believe that the medical profession doesn't view prescription addiction as they do even alcoholism and that's one thing I wanted to say is the doctors need to be aware that when we're honest with them and even with my doctors today I say, 'Put it on my charts, put it on my records that I am an addict and that under no circumstances are you to give me pain killers unless I'm in the hospital.' I do it to the pharmacies, I notify all the pharmacies that I am an addict."

Paul Rostykus, MD: "It's kind of a joint responsibility between the physician, the patient, and the pharmacist, and the physician's job is to know what the medications are, what the side effects are, interactions with other medications."

Gloria Elder, RPh: "I like to stress patient responsibility. I think people need to be aware of what they are taking, why they are taking it, how they should be taking it, what to look for, any kind of side effects that may need further attention."

Bob: "You're the final person who says that, 'Yes I'll take this, no I will not take this. And the doctor kind of has to understand what you are going through. But you have to trust your doctor to demand they sit down and explain things to you."