

## Original Version

*Much of the content in Lipscomb's various magazines is originally written by professors. Therefore, I often need to take a story written in an academic or research style and edit it to become an editorial news or feature story more digestible for a general audience. This story was an extreme example of this situation. Two professors were asked to write a story about a specific class they developed for the College of Pharmacy.*

By Susan Mercer, associate professor  
and Lindsey Gorrell, **job title**

Drug abuse and addiction is an ongoing issue in the United States. According to the U.S. Department of Health and Human Services 2013 National Survey on Drug Use and Health, over 24 million Americans report using illicit drugs in the previous 30 days and over 50 percent of the population reports the use of alcohol.<sup>1</sup>

A study by Rehm et al. showed that alcohol use costs the United States an estimated \$224 billion each year in both direct and indirect costs.<sup>2,3</sup> Additionally, the Centers for Disease Control and Prevention reported that in 2011, drug overdose was the leading cause of injury death in the United States with a majority of deaths being related to opioid analgesics.<sup>4</sup>

Despite increased awareness of drug abuse, it has become increasingly easier to acquire illicit drugs. It is estimated that nearly 54 percent of persons who use illicit drugs receive them from a friend or relative for free with an additional 11-16% buying illicit drugs.<sup>1,5</sup> An additional 18-19.7% receive these medications through one physician and another 1.9% receive them from more than one physician, a term referred to as "doctor shopping".<sup>1,5</sup>

Tennessee statistics mimic nationwide statistics with opioid prescription drugs being the primary substance of abuse.<sup>6</sup> This is particularly alarming as the amount of prescribed opiates has increased by 25% from 2010 to 2012.<sup>6</sup> The Tennessee Department of Mental Health and Substance Abuse Service (TDMHSAS) reported that over 2,000 people received opioids or benzodiazepines from more than four doctors in March of 2013 alone.<sup>6</sup> This has led to a rise in drug overdose deaths in Tennessee, with nearly 1,100 such deaths being reported in 2012, a 220% increase over a 13-year period of time.<sup>6</sup>

Drug abuse and diversion has infiltrated our healthcare system, both directly and indirectly. These startling statistics highlight the important role of pharmacists in fighting drug abuse. Thus, it is important for our student pharmacists to have a thorough understanding of the pharmacology behind common substances of abuse and how to approach these addictions from a clinical perspective in order to optimize patient care. Basic and clinical science faculty working together to deliver an integrated curriculum will ensure that pharmacy education is in line with the current demands of pharmacy practice, healthcare and society as a whole. Furthermore, it will enforce the concept of advanced critical thinking in clinical practice, preparing students for interprofessional collaboration. These statistics, combined with their common interests in substances of abuse, prompted Drs. Mercer and Miller to develop the elective pharmacy course, Drugs of Abuse and Addiction, for third year pharmacy students.

## Edited Version

*In this article, like many I edit from academics, the last paragraph became the first paragraph, as the "conclusion" actually needed to be the lead. For this publication I try to balance the content between a style that health care professionals will appreciate and a more journalistic style that others can relate to. In this case, I re-ordered the entire article and made sure to get the reason it was being printed much higher in the story.*

**HEADLINE: Examining the drug abuse crisis from different angles**  
**SUBHEAD: Integrated teaching enhances Drugs of Abuse and Addiction course**

*By Susan Mercer, associate professor of pharmaceutical sciences  
and Dr. Lindsey Miller, assistant professor of pharmacy practice*

Drug abuse and addiction is a very complex problem that our society and pharmacists deal with on a daily basis. According to the U.S. Department of Health and Human Services' 2013 National Survey on Drug Use and Health, more than 24 million Americans report using illicit drugs in the previous 30 days and more than 50 percent of the population reports the use of alcohol.

Drug abuse and diversion has infiltrated our health care system, both directly and indirectly. These startling statistics highlight the important role of pharmacists in fighting drug abuse. Thus, it is important for our student pharmacists to have a thorough understanding of the pharmacology behind common substances of abuse and how to approach these addictions from a clinical perspective in order to optimize patient care.

These disturbing statistics and our mutual interests in substances of abuse prompted us to develop the elective pharmacy course, Drugs of Abuse and Addiction, for third-year pharmacy students. The integrated teaching model we use in this course combines the expertise of a science-based faculty member (Mercer) and a practice-based faculty member (Miller) to produce a positive impact on student learning.

Basic and clinical science faculty collaborating to deliver an integrated curriculum ensures that pharmacy education is in line with the current demands of pharmacy practice, health care and society as a whole. Furthermore, it enforces the concept of advanced critical thinking in clinical practice, preparing students for interprofessional collaboration.

The two-credit-hour elective in Drugs of Abuse and Addiction was designed to investigate the pharmacological and psychological aspects associated with drug addiction from an interdisciplinary and interdepartmental perspective. Aspects of medicinal chemistry, pharmacology, pharmacokinetics and toxicology were discussed for drugs of abuse in the stimulant, depressant and psychedelic classes. Topics included concepts of neurotransmission, ADME and its relation to abuse potential, chronic drug administration and correlation to the development of tolerance and dependence, theories of addiction, patterns of abuse and treatment of addiction.

Dr. Susan L. Mercer, Ph.D. is an Associate Professor of Pharmaceutical Sciences in the College of Pharmacy. Dr. Mercer received her B.S. in Chemistry from Seton Hill University in 2004 and her Ph.D. in Pharmaceutical Sciences at the University of Maryland, School of Pharmacy in 2008. She joined the founding faculty of Lipscomb Pharmacy in 2008 where her major teaching responsibilities and research interests are in the areas of pharmaceutical and medicinal chemistry, central nervous system therapeutics and drugs of abuse/addiction. Dr. Mercer is also an Adjunct Assistant Professor in the Department of Pharmacology at Vanderbilt University and a member of the Vanderbilt Institute of Chemical Biology.

Dr. Mercer utilizes her skill set by conducting research at Lipscomb. Her primary research interests include the design and synthesis of molecules as potential tools to study biological systems concerned with drugs of abuse and the development of novel opioid analgesics with reduced side effects. Ideally, these novel compounds would reduce the potential for opioid tolerance, therefore, reducing the potential for abuse. However, Dr. Mercer does not work alone. She mentors both professional and undergraduate students, placing a special emphasis on training new waves of future scientists and practitioners. Students engage in research on multiple aspects of a project including chemical synthesis, purification, analysis and submission of compounds for biological analyses. Furthermore, students are immersed in the interpretation of pharmacological and pharmacokinetic data which leads to a comprehensive dissemination of research findings through scientific posters, presentations and publications.

Dr. Lindsey Miller, Pharm.D., BCPP, received her B.S. in Business Administration from Eastern Illinois University in 2002 and her Pharm.D. from West Virginia University School of Pharmacy in 2008. She went on to complete her Psychiatric Pharmacy Practice Residency at West Virginia University Hospitals and School of Pharmacy in 2009. Dr. Miller then joined the faculty at Lipscomb University College of Pharmacy as an Assistant Professor in Pharmacy Practice. Dr. Miller teaches Pharmacotherapy I, which covers psychiatric and neurologic illness, as well as the toxicology module. She also coordinates an elective class, Advanced Perspectives in Psychiatry and co-coordinates the Drugs of Abuse and Addiction elective with Dr. Susan Mercer.

In addition to teaching, Dr. Miller spends her mornings at Vanderbilt Psychiatric Hospital as part of an interdisciplinary team that treats patients experiencing exacerbations in their mental health. Students have the opportunity to take Dr. Miller for one of their elective Advanced Pharmacy Practice Experiences (APPE) in their fourth year. As part of their experience, they are able to round with the treatment team and participate in the comprehensive care of the patients, including counseling about medications, conducting educational groups and making clinical interventions. Due to the high incidence of comorbid substance abuse and mental illness, Dr. Miller and her students encounter patients fighting substance abuse and addiction on a daily basis. Thus, she believes it is important for student pharmacists to develop the skills necessary to treat this growing patient population.

A two credit hour elective in Drugs of Abuse and Addiction was designed to investigate the pharmacological and psychological aspects associated with drug addiction from an interdisciplinary and interdepartmental perspective. Aspects of medicinal chemistry, pharmacology, pharmacokinetics, and toxicology were discussed for drugs of abuse in the stimulant, depressant, and psychedelic classes. Topics included concepts of neurotransmission, ADME and its relation to abuse potential, chronic drug administration and correlation to the development of tolerance and dependence, theories of addiction, patterns of abuse, and treatment of addiction. Teaching methodology included didactic lecture, discussion, journal club, debates, a research paper with formal presentation, and an addiction exercise with reflection. Two external speakers presented to the class and a site visit to a residential drug court program was arranged. Nearly one-fourth of the material is presented by Drs. Mercer and Miller respectively, while the other half is co-taught. One of the unique features of the class is that it offers multiple perspectives on addiction and helps students ascertain why addiction occurs and how to effectively treat this increasing patient population.

Students were provided an opportunity to share direct written feedback for the course. Overall, student comments were positive, a few are included below:

Teaching methodology included didactic lecture, discussion, journal club, debates, a research paper with formal presentation and an addiction exercise with reflection. Two external speakers presented to the class and a site visit to a residential drug court program was arranged.

The class is greatly enhanced by our day-to-day research projects (Mercer) and current clinical practice (Miller). My primary research interests (Mercer) include the design and synthesis of molecules as potential tools to study biological systems concerned with drugs of abuse and the development of novel opioid analgesics with reduced side effects. Ideally, these novel compounds would reduce the potential for opioid tolerance, therefore, reducing the potential for abuse.

I (Miller) spend my mornings at the Vanderbilt Psychiatric Hospital as part of an interdisciplinary team that treats patients experiencing exacerbations in their mental health. Due to the high incidence of comorbid substance abuse and mental illness, my students encounter patients fighting substance abuse and addiction on a daily basis. Thus, I believe it is important for student pharmacists to develop the skills necessary to treat this growing patient population.

We each present one-fourth of the curriculum material in the course, while the other half is co-taught. One of the unique features of the class is that it offers multiple perspectives on addiction and helps students ascertain why addiction occurs and how to effectively treat this increasing patient population.

[DESIGNER'S NOTE: These quotes could be completely pulled out of the text and used as pull-quotes only, if that saves space. If you don't use all three as pull-quotes, then leave them in the text.]

Overall, student comments about the course have been positive:

- "By having a science- and clinical-based faculty member, we were able to discuss the chemistry of the drug in-depth as well as the clinical presentation of using/abusing the drug. This caused me to think more about my ideas regarding abuse/addiction and reevaluate my thinking about addicts."
- "The two faculty members complemented each other very well and were able to cover the same material, but from different angles allowing for greater understanding of the material."
- "As a pharmacist in a state where prescription drug abuse is on the incline, this course taught me what I needed to know to fully understand the problem."

#### **SUBHEAD: About Susan Mercer**

Susan Mercer, an associate professor of pharmaceutical sciences, received her B.S. in chemistry from Seton Hill University in 2004 and her Ph.D. in pharmaceutical sciences at the University of Maryland, School of Pharmacy in 2008. She joined the founding faculty at Lipscomb in 2008 where her major teaching responsibilities and research interests are pharmaceutical and medicinal chemistry, central nervous system therapeutics and drugs of abuse/addiction. Mercer is also an adjunct assistant professor in the Department of Pharmacology at Vanderbilt University and a member of the Vanderbilt Institute of Chemical Biology.

She mentors both professional and undergraduate students, placing a special emphasis on training new waves of future scientists and practitioners. Her students engage in research on multiple aspects of a project including chemical synthesis, purification, analysis and submission of compounds for biological analyses. Furthermore, her students are immersed in the interpretation of pharmacological and pharmacokinetic data which leads to a comprehensive dissemination of research findings through scientific posters, presentations and publications.

#### **SUBHEAD: About Lindsey Miller**

Dr. Lindsey Miller received her B.S. in business administration from Eastern Illinois University in 2002 and her Pharm.D. from West Virginia University's School of Pharmacy in 2008. She went on to complete her psychiatric pharmacy practice residency at West Virginia University Hospitals and School of Pharmacy in

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- The two faculty members complemented each other very well and were able to cover the same material, but from different angles allowing for greater understanding of the material.
- As a pharmacist in a state where prescription drug abuse is on the incline, this course taught me what I needed to know to fully understand the problem.

Drug abuse and addiction is a very complex problem that our society and pharmacists deal with on a daily basis. This integrated teaching model for a Drugs of Abuse and Addiction elective utilized the combined expertise of a science-based faculty member and a practice-based faculty member which had a positive impact on student learning.

#### References:

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