REVIEW

Substance Use Attitudes, Behaviors, Education and Prevention in Colleges of Pharmacy in the United States

Samah F. Al-Shatnawi, PharmD, PhD candidate, Matthew Perri III, PhD, Henry N. Young, PhD, Merrill Norton, DPh, PharmD

University of Georgia, Athens, Georgia

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This review describes and summarizes student pharmacists' substance use behavior in the United States. Current literature indicates that there are problems with alcohol and other drug use among student pharmacists. Although researchers have found variations in the type and rate of reported substance use, significant proportions of student pharmacists were identified as being at high risk for substance use disorders (SUDs). Findings from this review suggest that pharmacy schools should encourage and stimulate more research in order to implement effective screening and early intervention programs in an effort to address this important student health issue.

Keywords: substance use disorders, substance use behaviors, student pharmacists, colleges of pharmacy

INTRODUCTION

Healthcare professionals are at risk for developing substance use disorders (SUDs).¹ According to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), SUD is the updated term that embraces the two interrelated conditions of substance abuse and dependence.²⁻⁴ The term *addiction* was completely eliminated from the updated SUD terminology in the DSM-5 because of its debatable definition and associated stigma.³ The unidimensional disorder (SUD) is defined as a "problematic pattern of behaviors related to the use of substance" that can lead to significant impairment or distress.²⁻⁵ Table 1 lists SUD criteria specified in the DSM-5 manual. SUD clinical and functional impairments may include health problems, disabilities, and being unable to meet significant obligations at home, school, and/or work.^{4,5} The most common substances associated with SUD in the United States include alcohol, tobacco, cannabis, stimulants, hallucinogens, and opioids.^{2,5}

In 2003, the National Institute on Drug Abuse (NIDA) stated that 8% to 12% of healthcare workers had chemical dependencies.⁶ Approximately 10% to 15% of healthcare professionals are estimated to misuse alcohol or drugs at some time during their career.¹ Among healthcare professionals, pharmacists play a central role in medical care and are medication experts, yet they are

highly vulnerable to SUDs.¹ Research shows that approximately 40% of pharmacists have reported nonmedical use of prescribed drugs.⁷⁻¹⁰ In addition, a higher percentage of pharmacists report lifetime use of an opioid or anxiolytic (approximately 25% and 14%, respectively) as compared to nurses (15% and 8%, respectively).¹¹ As a result, the healthcare process and patients' health might be threatened.

Substance use behaviors and/or disorders may develop during preprofessional years (ie, college years or even before).^{12,13} In one study, 88% of pharmacy practitioners who admitted lifetime use of nonprescribed drugs began to use drugs during college.⁷ In general, substance use behaviors among college students have been a concern for many years. According to the National Survey on Drug Use and Health (NSDUH), college students are more likely than their same age group (18-22 years) counterparts to report alcohol use.¹⁴ Higher rates of current (within the past 30 days), binge (5 or more drinks at the same time or within 2 hours on one or more days in the past month), and heavy (5 or more drinks on the same occasion on 5 or more days in the past month) alcohol use were reported by college students as compared to rates reported by young adults not enrolled in college.¹⁵ In addition to alcohol, research shows that college students commonly report use of other substances. For example, in a 2014 national survey, 22.3% of college students reported using illicit drugs in the past month.¹⁵

Previous research also suggests that healthcare professional students are a significant subsample of the college student population that is at higher risk for

Corresponding Author: Merrill Norton, 250 W. Green St., the University of Georgia College of Pharmacy, Room PS222C, Athens, GA 30602. Tel: 706-331-4201. E-mail: mernort@uga.edu

Table 1. Diagnostic Criteria for Substance Use Disorders (SUD)²

Impairment of control over substance use criteria: ²
1. Substance used in larger quantities or over an extended period than it is intended. ²
2. Having tenacious desire or being unsuccessful in controlling, reducing, or quitting substance use. ²
3. Spending a lot of time to obtain a substance, use a substance, and recover from its effects. ²
4. Craving or having a strong desire to use a substance. ²
Impairment of control over social activity criteria: ²
5. Recurrent substance use resulting in failure to complete major role obligations at work, school, or home. ²
6. Continued substance use regardless having continuous interpersonal and / or social problems. ²
7. Withdraw from important social, occupational, recreational, and family activities because of substance use. ²
Impairment of control over risky substance use criteria: ²
8. Persistent substance use in situations where substance use is physically dangerous. ²
9. Continued substance use regardless having the knowledge about physical or psychological problems that might be caused or deteriorated by the used substance. ²
Substance use related pharmacological criteria: ²
10. Tolerance ²
i. Increased need for higher doses of substance over time to reach the desired effects. ²
ii. Not reaching the desired effects with continuous use of the same substance dose. ²
11. Withdrawal ²
i. Reporting characteristic substance withdrawal symptoms. ²
ii. Using same substance or a closely related substance to overcome withdrawal symptoms ²
Severity level of SUD is based on the number of reported criteria within 12 month period:
A. MILD: Presence of 2-3 criteria. ²
B. MODERATE: Presence of 4-5 criteria ²
C. SEVERE: Presence of 6 or more criteria. ²

problematic substance use behaviors.¹⁶⁻¹⁸ However, less research has examined substance use among student pharmacists in comparison to other healthcare professional students.^{8,9,18,19} Substance use and its disorders can cause personal disruption and loss of productivity at school and professionally. The primary purposes of this literature review were: to highlight what is known about substance use behaviors among student pharmacists, and to identify factors that might influence problematic substance use behaviors among student pharmacists.

METHODS

This review includes studies completed within US colleges and universities identified through multiple databases (PubMed, Web of Knowledge, Google Scholar, and PsycINFO). Searches were conducted using the key words “substance use” OR “alcohol” OR “caffeine” OR “cannabis” OR “hallucinogen” OR “inhalants” OR “opioids” OR “sedatives” OR “hypnotics” OR “anxiolytics” OR “stimulants” OR “tobacco” AND “student pharmacists” OR “pharmacy schools” in the title and/or abstract. Limitations imposed within the search included English language and research conducted in human subjects. Further, cited references in all articles obtained by the aforementioned databases were reviewed. For the purpose of

this review, any article on student pharmacists’ substance use behaviors was included and the focus was on substance use rates or levels (quantity and frequency of substance consumption), motives for any substance use, and substance use-related problems (negative outcomes).

FINDINGS

The literature search identified 16 studies. Thirteen articles assessed student pharmacists’ use of various substances,^{8,11,15,16,18-26} two articles solely focused on alcohol use,^{27,28} and one article examined only stimulants use.²⁹ Table 2 summarizes the studies found through this search. The following paragraphs summarize the findings of these studies by substance type.

Previous researchers primarily focused on alcohol consumption and alcohol-related problems among student pharmacists. Alcohol was identified as the most used substance by student pharmacists.^{16,22} Problematic alcohol use was reported in a significant number of reviewed studies.^{11,16,18,27,28,30} In two recent studies, the Alcohol Use Disorders Identification Test (AUDIT) was used to evaluate alcohol use patterns among student pharmacists.^{27,28} These studies showed similar results with approximately 25% of participants reporting hazardous or harmful drinking (AUDIT score ≥ 8). Binge drinking

Table 2. Key Studies That Assess Substance Use Patterns Among Student Pharmacists

Study, year	Assessed Substances	Location, Year of Data Collection	Students sample: n, RR		Results (Student Pharmacists)	Provided Comparison
			Student pharmacists: n, RR [Design/Measures]	pharmacist		
Normark et al, ¹⁸ 1985	Alcohol	North Carolina, 1983	Student pharmacists: 391, 82%		Students believe drug abuse is a problem in pharmacy school: >37%	As compared to students in 3 rd year, 4 th and 5 th year students believed that alcohol and drug abuse problems were less severe in pharmacy school.
	Other drugs (not specified)		Study sample didn't include other students or professionals		Students believe alcohol abuse is a problem in pharmacy school: >80%	
Mcauliffe et al, ⁸ 1987			Cross-sectional study of substance use impairment risk with self-reported alcohol and other drugs use (in class paper & pencil)/ 15 item survey, collected from previous measurements, no information about reliability &/or validity.		Fourth year students: 40% Fifth year students: 58% Students with potential or actual substance use problems: 17.6%	
	Marijuana Cocaine Opiates Sedatives Stimulants Tranquilizers Hallucinogens	New England state, 1984	Student pharmacists: 278, 67%	Past-year use of any controlled substance without a prescription: 41%		As compared to professional pharmacists in this study, student pharmacists reported a significantly higher rate of recreational drugs use.
Miller & Banahan III, ²² 1990			Cross-sectional study of self-reported use (mail survey)/ 40 item survey, no information about reliability &/or validity.	Lifetime use of any controlled substance without a prescription: 66.7% Past-year recreational drugs use: 36% Lifetime recreational drugs use: 57%		
	Alcohol Marijuana Amphetamines Barbiturates Tranquilizers Cocaine Heroin Ecstasy	8 pharmacy schools in the Southeastern U.S., 1986	Student pharmacists: 1440, RR=Not Reported	Past-year consumption of alcoholic drinks: 76.5% Past-year marijuana use: 13.8% Past-year amphetamines use: 6.8%		As compared to general college students, ⁴⁷ student pharmacists in this study were significantly less likely to report past-year use of alcohol, marijuana, amphetamines, barbiturates, and cocaine.
			Study sample didn't include other students or professionals	Past-year tranquilizers use: 4% Past-year barbiturates use: 0.9% Past-year cocaine use: 3.1% Past-year ecstasy use: 3.1%		
			Cross-sectional study of self-reported use (in class paper & pencil) / 91 item survey, modified from Monitoring the Future project survey.			

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Table 2. (Continued)

Study, year	Assessed Substances	Location, Year of Data Collection	Students sample: n, RR Student pharmacists: n, RR [Design/Measures]	Results (Student Pharmacists)	Provided Comparison
Rascati et al, ²⁶ 1993	Alcohol Cocaine Marijuana Amphetamines	3 pharmacy colleges in Texas, year was not provided	Student pharmacists: 603, 90% Study sample didn't include other students or professionals Cross-sectional study of self-reported use (in class paper & pencil) / pre-tested survey from Monitoring the Future project.	Past-year heroin use: 0.2% Lifetime consumption of alcoholic drinks: 82.3% Lifetime marijuana use: 39.3% Lifetime amphetamines use: 17.8% Lifetime cocaine use: 11.6% Lifetime ecstasy use: 5.8% Lifetime heroin use: 1.3% Lifetime consumption of ≥ 2 alcoholic drinks on at least 1 occasion: 86% Past-year consumption of ≥ 2 alcoholic drinks on at least 1 occasion: 72% Past-year marijuana use: 6.0% Past-year cocaine use: 1.0% Past-year amphetamines use: 3.0% Lifetime marijuana use: 26.0% Lifetime cocaine use: 7.0% Lifetime amphetamines use: 9.0%	As compared to older studies, ^{8,31,32} student pharmacists in this study reported lower rates of amphetamine, cocaine, and marijuana use.
Kriegler & Baldwin, ²⁵ 1994	Alcohol Tobacco Stimulants Marijuana Opiates Cocaine Sedatives Hallucinogens Amphetamines	Midwestern Health Science University (Nebraska), 1990	Students sample: 1707, 57.6% Student pharmacists: 161, 81.7% Cross-sectional study of self-reported use (in class paper & pencil)/ 75 item (pilot tested) survey, no information about reliability &/or validity).	Past-year alcohol use: 90.5% Consumption of ≥ 5 drinks in the past 2 weeks: 40.8% Regular consumption of alcohol on weekly basis: 32.2% Past-year tobacco use: 22.2% Daily tobacco use (within past-year): 5.1% Past-year stimulants use: 19.0%	As compared to campus average drinking rates, student pharmacists reported higher rate of binge drinking (40.8%). Similarly, student pharmacists reported higher past-year use rates of amphetamines, sedatives, and stimulants

(Continued)

Table 2. (Continued)

Study, year	Assessed Substances	Location, Year of Data Collection	Students sample: n, RR		Results (Student Pharmacists)	Provided Comparison
			Student pharmacists: n, RR	[Design/Measures]		
Noormohamed et al, ¹⁹ 1998	Alcohol Marijuana Cocaine Amphetamines	3 pharmacy schools (UI, MCP, & TSU), year was not provided	Student pharmacists: 848, 50%	Study sample didn't include other students or professionals Cross-sectional study of self-reported use (in class paper & pencil) / survey with no further information.	Alcohol use within the past 3 months: 73.3% Consumption of ≥ 5 drinks on the same occasion within the past 3 months: 51.9% Lifetime marijuana use: 12.4% Lifetime cocaine use: 5.4% Lifetime amphetamines use: 3.9%	compared to average campus use rates. Consequently, in comparison to other student groups in this campus, student pharmacists reported more negative consequences related to alcohol and drug use. This study found higher rate (68%) of consuming ≥ 5 drinks/occasion in the past 3 months among UI students as compared to students from TSU (44%) & MCP (42%). Lifetime marijuana use was the highest among UI students (22%) as compared to TSU (12.9%) & MCP (3.7%). However, lifetime cocaine use was the lowest among UI students (2%) as compared to students in TSU (3.6%) & MCP (9.3%). Relative to national college students, this study showed similar or even higher rates of alcohol and other drug use in student pharmacists.
Murawski & Juergens, ²³ 2001	Alcohol Tobacco Marijuana Cocaine	University of Mississippi, 1995-1999	Student pharmacists: 1995: 168, RR=Not Reported 1996: 172, RR=Not Reported 1997: 246, RR=Not Reported	Drinking alcohol started at age less than 21 years: 48.9% Current alcohol use (active	As compared to older studies conducted in the late 1980s, ^{25,26,31} this study showed lower rates of	

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Table 2. (Continued)

Study, year	Assessed Substances	Location, Year of Data Collection	Students sample: n, RR pharmacists: n, RR [Design/Measures]	Results (Student Pharmacists)	Provided Comparison
Kenna & Wood, ¹¹ 2004	Hallucinogens	Northeastern state, 2000	1998: 171, RR=Not Reported	alcohol consumers: 66.7%-75.0%	current alcohol use among student pharmacists.
	Amphetamines		1999: 238, RR=Not Reported	Past-year binge drinking (≥ 5 drinks at one occasion): 33.3%	Furthermore, this study indicated that student pharmacists consumed less alcohol and reported less use of other substances as compared to the general college population.
			Study sample didn't include other students or professionals	Lifetime marijuana use: very little reported use (% not specified)	
			Longitudinal study of self-reported use (paper and pencil)/ 21 item survey, with no information about pilot test &/or reliability & validity.	Past-year tobacco use (daily): 10.3%	
				Tobacco use started at age less than 21years: 14.5%	
	Alcohol		Students sample: 135, 35.3%	Lifetime alcohol use: 92.0%	Regarding alcohol consumption, student pharmacists reported lower rate of consuming ≥ 5 drinks during the past 2 weeks as compared to general college students in 2000. ⁴⁸ For tobacco use, student pharmacists were less likely to use tobacco (lifetime or daily) than nursing students and other college students. As compared to nursing students in, student pharmacists reported lower rates of lifetime use of non-medical prescription drugs. Student pharmacists were less likely to report (lifetime or monthly) marijuana use than nursing students. Student pharmacists reported
	Tobacco		Student pharmacists: 87, 45.5%	Consumption of ≥ 5 drinks during the past 2 weeks: 35.7%	
	Stimulants		Cross-sectional study of self-reported use (in class paper & pencil)/ general questions about lifetime and monthly use of alcohol and other substances, with no information about reliability or validity.	Lifetime and daily tobacco use, respectively: 57.5% & 4.6%	
	Marijuana			Lifetime and monthly marijuana use, respectively: 49.4% & 14.0%	
	Opiates			Lifetime and monthly cocaine use, respectively: 3.4% & 1.2%	
	Sedatives			Lifetime and monthly opiates use, respectively: 14.9% & 0.0%	
	Cocaine			Lifetime and monthly stimulants use, respectively: 8.0% & 3.5%	
	Hallucinogens			Lifetime and monthly anxiolytics use, respectively: 5.7% & 0.0%	
	Anxiolytics				
	Barbiturates				

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Table 2. (Continued)

Study, year	Assessed Substances	Location, Year of Data Collection	Students sample: n, RR		Results (Student Pharmacists)	Provided Comparison
			Student pharmacists: n, RR	[Design/Measures]		
Baldwin et al, ¹⁶ 2006	Alcohol	Nebraska, 1999	Students sample: 2646, 56.4% Student pharmacists: 427, 66.1% Cross-sectional study of self-reported use (in class paper & pencil + school mail)/ Survey instrument from previous study. ²⁷		Past-year alcohol use: 81.2% Past-year consumption of ≥ 5 drinks per occasion: 17.1% Past-year tobacco use: 25.8% Past-year drug use: 8.9% Past-year marijuana use: 5.9% Past-year amphetamine use: 1.2% Past-year sedatives use: 3.0% Drive under the influence: 40% Attend class and/or work under the influence: 8.2% Lifetime opioids use: 8.0% Lifetime stimulants use: 7.0% Past-year opioids use: 5.0% Past-year stimulants use: 5.0% Past-year alcohol use: 77.0% Past-week drinking of more than one drink per day: 14.0% Past-year tobacco use: 32%	higher rate of lifetime opiate use than general college students, ⁴⁸ however, nursing students reported a significantly greater rate (39.2% vs. 14.9%). Similarly, student pharmacists were less likely to report anxiolytics, sedatives, and muscle relaxants than nursing students. As compared to students in other programs (medical, dental, nursing, and allied health) in this study, student pharmacists reported the least consumption of marijuana (5.9%), opioids (0.7%), and hallucinogens (0.2%) within the Past-year, but they consumed the most of stimulants (Amphetamines).
	Tobacco					
	Marijuana					
	Cocaine					
	Sedatives					
	Opioids					
	Hallucinogens					
Lord et al, ²⁴ 2009	Alcohol	Private urban college of pharmacy in the North-eastern U.S., 2006	Student pharmacists: 950, 62% Study sample didn't include other students or professionals Cross-sectional study of self-reported use (online)/ 95 item survey with no information about reliability & validity.		As compared to national survey results on general college students, ^{49,50} student pharmacists showed similar rates of non-medical prescription medications use. These findings contradict the results from a previous study	
	Tobacco					
	Stimulants					
	Marijuana					
	Opioids					
	Hallucinogens					
	Sedatives					
	Cocaine					

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Students sample: n, RR

Study, year	Assessed Substances	Location, Year of Data Collection	Students sample: n, RR		
			Student pharmacists: n, RR [Design/Measures]	Results (Student Pharmacists)	Provided Comparison
Baldwin et al, ¹⁵ 2011	Alcohol Tobacco Marijuana Cocaine Sedatives Opioids Hallucinogens Amphetamines	1 public southwestern & 2 (public & private) Midwestern pharmacy schools, 1999	Student pharmacists: 566, 86.5% Study sample didn't include other students or professionals Cross-sectional study of self-reported use (in class paper & pencil) / 62 item survey that was taken from a survey (after slight modifications) used in a previous study. ²⁷	Past-year tobacco use (monthly): 10%	Past-year alcohol use was the lowest among the Midwest private school students (73.2%) and the highest among Midwest public students (93.2%). Tobacco use was 1.4% higher among Midwest public students as compared to their results in 1990. ²⁵ Tobacco use in student pharmacists was higher than medical, dentistry, and allied health students. However tobacco use in student pharmacists was 11% lower than nursing students. ¹⁶ The use of other substances was similar across all schools. Sedatives use was very low in Midwest public students (0.6%) as compared to other students in Midwest private (4.7%) & Southwest public (5.9%). As compared to national results on college students
				Past-year marijuana use: 21.0%	
				Past-year sedatives use: 5.0%	
				Past-year hallucinogens use: 3.0%	
				Past-year cocaine use: 2.0%	
				Past-year alcohol use: 82.2%	
				Past-year tobacco use: 25.4%	
				Past-year marijuana use: 6.9%	
				Past-year cocaine use: 0.7%	
				Past-year opioids use: 1.7%	
English et al, ²⁷ 2011	Alcohol	9 pharmacy schools	Student pharmacists: 1161, RR = ?	Past-year alcohol use: 86.4%	
				Past-year report of hazardous	

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Table 2. (Continued)

Study, year	Assessed Substances	Location, Year of Data Collection	Students sample: n, RR		Results (Student Pharmacists)	Provided Comparison
			Student pharmacists: n, RR	[Design/Measures]		
Bossaer et al, ²⁹ 2013	Stimulants	(1 public in Northeast, 1 private in Northeast, 1 private in South, 2 private in Midwest, 1 public in Midwest, 1 public in West, & 2 public in South), 2009-2011	Study sample didn't include other students or professionals	Cross-sectional study of self-reported use (online & in class paper & pencil) / 32-item questionnaire including AUDIT.	alcohol use (AUDIT $\geq$ 8): 25.2% Past-year report of high degree of alcohol related problems (16 $\geq$ AUDIT $\geq$ 19): 3.0% Past-year report of symptoms that suggest alcohol dependence: 25%	in 2009, ⁴⁹ this study reported higher rates of alcohol consumption among student pharmacists. As well, student pharmacists in this study reported higher AUDIT scores as compared to a national sample of medical students (15.4% with AUDIT $\geq$ 8) in 2009 study. ⁵¹
		East Tennessee State University, 2011	Students sample: 372, 59.9% Student pharmacists: 225, 70.5% Cross-sectional study of self-reported use (online survey) / 23-item questionnaire created by healthcare professionals (medicine & pharmacy) with no information about pilot test and/or reliability & validity.	Lifetime stimulants use: 9.7% Main reasons for using stimulants: improve academic performance, enhance alertness and energy, get high (recreational use), and drug experimentation. Negative consequences associated with stimulants use: criticism from others, more doctor visit, and inability to take OTC medications.	Rate of non-medical prescription stimulants use among student pharmacists was similar to the rates reported by healthcare professional students (medical and respiratory therapy students).	
Volger et al, ²¹ 2013	Stimulants Tobacco Marijuana Cocaine Prescription medications: (sedatives & pain medications)	North Carolina, 2012	Student pharmacists: 407, 39% Study sample didn't include other students or professionals	Cross-sectional study of self-reported use (online) / 22 item survey with no	Lifetime stimulants use: 11.6% Non-medical use of prescription stimulants in pharmacy school: 8.8% Non-medical use of prescription stimulants during the past 5 months: 3.2%	As compared to other studies among general college students, ^{50,52,53} student pharmacists in this study showed higher prevalence of lifetime non-medical use of prescription stimulants. Similarly, as compared to

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Table 2. (Continued)

Study, year	Assessed Substances	Location, Year of Data Collection	Students sample: n, RR		Results (Student Pharmacists)	Provided Comparison
			Student pharmacists: n, RR [Design/Measures]	information about pilot test and/or reliability & validity.		
Bidwal et al, ²⁰ 2014	Alcohol	5 Pharmacy schools, 2 medical schools, & 5 physician assistant schools in California, 2011	Students sample: 589, RR = Not Reported Student pharmacists: 309, RR = Not Reported Cross-sectional study of self-reported use (online)/ 50 item survey with no information about pilot test and/or reliability & validity.	Under-age alcohol use: 59.9% Under-age tobacco use: 13.27% Lifetime marijuana use: 27.0% Lifetime use of prescription medications (sedatives & pain medications): 7.6% Past-year stimulants use: 6.1% Past-year opioids use: 2.3% Past-year anxiolytics use: 2.9% Past-year alcohol use: 64.1% Past-year tobacco use: 8.1% Past-year caffeine pills use: 10.4% Past-year caffeinated energy drinks use: 45.6% Past-year binge alcohol use (≥ 5 drinks at one occasion): 31.1% Past-year heavy alcohol use (≥ 5 drinks on the same occasion on ≥ 5 days within 30 days): 9.1% Past-year marijuana use: 7.4% Past-year cocaine use: 0.3% Past-year hallucinogens use: 0.6% Past-year heroin use: 0.3%	Lord et al. ²⁴ study, this study showed a 4% increase in the prevalence of lifetime non-medical use of prescription stimulants. As compared to previous studies, ^{11,24} this study showed lower rates of stimulants, marijuana, hallucinogens, and opiates use among student pharmacists. As compared to medical and physician assistant students in this study, student pharmacists were less likely to report binge &/or heavy alcohol use as well as non-medical use of stimulants and marijuana. In general, this study found that rates of substance use among professional students are less than general college students. However, higher rates of non-medical prescription stimulants use were reported in this study as compared to national college students.	
	Tobacco					
	Caffeine					
	Stimulants					
	Opioids					
	Anxiolytics					
	Marijuana					
	Cocaine					
	Hallucinogens					
	Heroin					

(Continued)

Table 2. (Continued)

Study, year	Assessed Substances	Location, Year of Data Collection	Students sample: n, RR		Results (Student Pharmacists)	Provided Comparison
			Student pharmacists: n, RR	[Design/Measures]		
Oliver et al, ²⁸ 2014	Alcohol	Auburn University, year was not provided	Student pharmacists: 349, 82.5%	Study sample didn't include other students or professionals	Past-year report of hazardous or harmful alcohol use (AUDIT $\geq$ 8): 23.2%	As compared to a previous study conducted by English et al, ²⁷ this study showed similar percentage of hazardous or harmful alcohol use patterns among student pharmacists.
				Cross-sectional study of self-reported use (in class paper & pencil) / AUDIT & DMQ-R.	Past-year report of large and frequent (hazardous) alcohol consumption: 67.2%	
					Past-year report of symptoms that suggest alcohol dependence: 29.5%	
					Past-year report of alcohol related harms: 46.7%	

Abbreviations: RR: Response rate; AUDIT: Alcohol Use Disorders Identification Test; DMQ-R: Drinking Motives Questionnaire Revised; UI: University of Iowa; MCP: Massachusetts College of Pharmacy; TSU: Texas Southern University; OTC: over-the-counter.

(consumption of 5 or more drinks in one occasion) also was assessed in previous studies.^{16,19,30} Results from two studies found that approximately 30% of student pharmacists had at least one binge drinking episode during the preceding 2 weeks.^{16,30} In another study conducted by Kenna and Wood, 36% of student pharmacists reported binge drinking within the past 2 weeks.¹¹ A more recent study conducted by Bidwal and colleagues found similar results with 31% of respondents reporting binge alcohol use within the past-year.²⁰

Fewer studies have investigated tobacco use among student pharmacists.^{11,16,30} Some researchers included questions within their surveys to assess tobacco use as a covariate that might influence student pharmacists' use of other substances.^{20,23-25,27} Kenna and Wood found that approximately 58% of student pharmacists reported a lifetime tobacco use.¹¹ Between 1990 and 2011, past-year tobacco use ranged between 8.1%-32%.^{20,24} While the most recent study conducted by Bidwal and colleagues in 2011 reported the lowest percentage of past-year tobacco use (8.1%),²⁰ the highest percentage (32%) was reported by Lord and colleagues based on data collected in 2006.²⁴ For regular tobacco use, Lord reported that 10% of student pharmacists used tobacco *a few times a month or even more*.²⁴ Murawski and Juergens found similar results with approximately 10% of student pharmacists reporting daily tobacco use (data collected between 1995 and 1999).²³ However, other reports based on data collected in 2000 and 1990 showed 4.6% and 5.1% of daily tobacco use among student pharmacists, respectively.^{11,25}

Caffeine Use

The search identified only one study that investigated caffeine use among student pharmacists.²⁰ In a study of student pharmacists' use of stimulants, Bidwal and colleagues found that 45.6% used caffeinated energy drinks and 10.4% used caffeine pills during the past year.²⁰

Marijuana Use

Since 1990, marijuana was identified as the second most used substance after alcohol by student pharmacists.^{8,11,22} Rates of current marijuana use in recent studies ranged from 6%-21%, and rates for lifetime use were between 14% and 33%.^{11,20,24,30} As an example, Lord and colleagues found that 21% of student pharmacists reported the use of marijuana in the preceding year.²⁴ Among these students, 5% reported using marijuana regularly on a monthly basis.²⁴ However in studies conducted before 1993, researchers found higher rates of current (between 14% and 28%) and lifetime (between 39% and 52%)

marijuana use among student pharmacists.^{8,26,31,32} Notably, the literature suggests a reduction in the rates of past-year marijuana use among student pharmacists (from 21%²⁴ to 7.4%)²⁰ based on data collected in 2006 and 2011).

Nonmedical Use of Prescription Drugs

Nonmedical use of prescription drugs was described as any use of prescription drugs without a legal prescription, or the use of prescribed medications in ways other than prescribed by healthcare providers, such as taking higher doses or changing route of administration.^{8,20,21,24} In late 1980s, a significant proportion of student pharmacists reported lifetime (66.7%) and past-year (41%) use of controlled substances without a legal prescription.⁸ Specific classes of drugs misused during pharmacy school years are discussed below.

Prescription Stimulants. A small but significant proportion of student pharmacists reported misusing prescription stimulants.^{8,16,24,25} The most commonly reported stimulants used by student pharmacists include dextro-amphetamine, amphetamine, and methylphenidate.^{20,24,29} Five percent to 19% of respondents disclosed their current (within the past-year) nonmedical use of prescription stimulants.^{11,24,25} In 2004, Kenna and Wood stated that prescription stimulants were highly or frequently used by student pharmacists; 3.5% of their study respondents used them on a monthly basis.¹¹ A recent study found that approximately 9% of student pharmacists used stimulants at some time during their college years, and 3.2% reported nonmedical use within the past 5 months.²¹ Other studies found that between 7% and 9.7% of student pharmacists reported a lifetime nonmedical use of prescription stimulants.^{20,24,29} Lord and colleagues²⁴ found a 7% lifetime stimulants use in 2009. However, in a more recent study, Volger and colleagues²¹ found a 11.6% lifetime stimulants use.

Prescription Opioids. Reported rates of misuse of prescription opioids among student pharmacists range between 8% and 15% (lifetime),^{10,28} and 1% to 6% (current use).^{11,20,24,30} With respect to the two most recent reports (data collected in 2006 and 2011), past-year prescription opioid misuse was reported by 5% and 2.3% of student pharmacists, respectively.^{20,24} Rates of past-year prescription opioid misuse in student pharmacists increased from 1.7%³⁰ in 1999 to 5%²⁴ in 2006. However in 2011, past-year misuse of prescription opioids was reported by only 2.3% of student pharmacists.²⁰

Other Illicit Drugs Use

The literature search found mixed results regarding the use of other illicit drugs such as cocaine, ecstasy,

heroin, and hallucinogens among student pharmacists. A majority of studies found that no more than 3% of student pharmacists reported lifetime or current use of cocaine, ecstasy, heroin, or hallucinogens.^{16,20,22,24,30} However, Miller and Banahan found lifetime use rates of 11.6% for cocaine and 5.8% for ecstasy among student pharmacists in 1990.²² Similarly, Rascati and colleagues found that 7% of students reported lifetime use of cocaine in 1993.²⁶ A more recent study reported a significantly higher percentage (13.8%) of lifetime hallucinogen use among student pharmacists.¹¹

Potential Factors Influencing Alcohol and Other Drug Use Behaviors

Age of first use. Evidence suggests many student pharmacists began substance use and/or experimentation at an early age.^{23,24,27,28,30} Some studies report underage alcohol use by student pharmacists, in one study, as early as 10 years.^{23,27,30} In a study conducted in 1999, Baldwin and colleagues reported that more than half of study participants used alcohol on a monthly basis before the age of 21 years.³⁰ Previous research also documented drug experimentation at very early ages (in junior high school, high school, or at any age before 21 years).^{24,30} Approximately 28% of student pharmacists reported drug experimentation at an age less than 21 years.³⁰ In 2008, Lord and colleagues found that approximately 5% and 4% of study respondents indicated their use of opioids and stimulants at ages less than 21 years, respectively.²⁴

Gender. Despite the dominance of female enrollments in pharmacy schools, male gender was a significant predictor of substance use behaviors in most studies.^{11,24,27,28} Oliver and colleagues and English and colleagues observed that male participants were statistically more likely to report hazardous or harmful alcohol use (score 8 or more on the AUDIT) compared to their female counterparts.^{27,28} Similarly, being a male was identified as a significant predictor for reporting use of opioids in the past year.²⁴

Family history. Significant percentages of student pharmacists reported having family members with SUDs.²³ Student pharmacists with family histories of alcohol and/or drug problems were more likely to have substance use-related behavioral problems (eg, reported a high lifetime and/or past-year use) than their peers from families with no reported alcohol or drug use problems.^{11,25} Notably, all of these studies were based on students' perceptions of family-members behaviors, which may have been confounded by the respondent's own drug and alcohol use and perceived norms.

Access to prescription drugs. Concerning student pharmacists' access to controlled drugs, the vast majority

of those who reported nonmedical use of prescription drugs, acquired these drugs illegally (with no valid prescriptions).²⁴ Easy access to prescription drugs was reported by student pharmacists.^{8,11} Where these drugs were acquired, with students indicating worksite settings (community and/or outpatient pharmacies), school, and friends as the primary sources of drugs.^{8,20,24}

Other potential factors. Several other factors such as coping with stress, performance enhancement, self-treatment and recreational purposes have been associated with student pharmacists' substance use. Student pharmacists have reported higher levels of stress as compared to the general adult population.^{18,20,33,34} Alcohol use may be employed as a coping strategy to deal with stress among student pharmacists.^{16,28,34,35} Regarding prescription stimulants, student pharmacists indicated that these drugs were primarily used to enhance performance (alertness and concentration) at school or work.^{21,24,29} Self-treatment was the most commonly reported reason for using prescription opioids.²⁴ Specifically, student pharmacists reported using opioids to relieve stress or relax (29%), deal with chronic pain (23%), improve sleep (20%), and manage depression (11%).²⁴ Finally, recreational use was among the most commonly reported reasons for illicit drug use (eg, marijuana) by student pharmacists.^{8,21,24}

Substance Use Related Outcomes and Student Pharmacists' Perceptions

Researchers have found negative outcomes associated with student pharmacists' substance use. These negative outcomes can be classified as educational (eg, attending class under the influence,^{16,22,25,27,30} missing classes,²⁵ receiving poor grades or evaluations^{16,20,26}), risky-health behavioral (eg, unintended sexual contact,^{19,23,27} driving under influence or joining intoxicated driver,^{16,20,30} experiencing blackouts^{16,30}), and professional (eg, taking care of patients while intoxicated,^{16,25,30} missing work or going to work while intoxicated,^{16,22,25,27,30} dealing with legal charges^{16,25,30}). One study showed that student pharmacists had the highest rates of negative outcomes (eg, missing class or work, attending class or work while intoxicated, receiving lower grades or evaluation, dealing with legal and financial problems, facing marital and relationship problems, and taking care of patients while intoxicated) related to substance use among students from all other healthcare professional programs (dentistry and allied health).²⁵

Previous studies also indicated that student pharmacists have concerns regarding the extent to which substance use is addressed in pharmacy schools.^{18,25} Approximately 34% of student pharmacists believed that

prescription drug misuse is a critical issue that needs to be seriously reviewed.²¹ A substantial proportion of student pharmacists reported that their knowledge about substance use and SUD was insufficient.^{23,26,30} In a study conducted in 1999, Baldwin and colleagues found that only 9% of student pharmacists considered the available school's resources (eg, health counseling groups) as the first choice when seeking assistance for alcohol or drug use problems.³⁰ In addition, student pharmacists have indicated that there is a lack of policies regarding substance use, impairments, and recovery in pharmacy schools (eg, treatment confidentiality and students' accountability).^{23,30}

Methodological Considerations

The reviewed studies have methodological issues that warrant discussion. First, all reviewed studies relied on self-reported data,^{11,16,20,21,24,27,28,30} which may be subject to "reporting bias." There were no attempts to cross validate self-reported data with other measurements of substance use (eg, biological tests or standardized screening tools). Student pharmacists' future careers are affected by documented substance use problems (eg, licensing and practice regulations). Therefore, students may be more likely to underreport substance use behaviors. Second, previous research was not consistent in defining and measuring substance use behaviors among student pharmacists. For example, binge drinking was defined differently in 6 out of 9 studies^{11,15,16,19,20,23-26}. Several of the reviewed studies evaluated substance use over different time periods (eg, during the past 2 weeks,^{11,25} past 3 months,¹⁹ over the past year^{16,24}). Furthermore, many of the studies used substance use measures that were not rigorously developed/tested, or failed to provide information regarding the measures' psychometric properties (eg, reliability, validity).^{8,11,20,21,23-25} These measurement issues may limit the ability to: obtain accurate assessments of problematic substance use among student pharmacists, evaluate the longitudinal change in student pharmacists' behavior of substance use, and compare and contrast results across study populations. Finally, there is a general lack of information in the literature regarding student pharmacists' substance use. The majority of reviewed studies were conducted before 2010. Only 5 studies presented data collected within or after 2010 (5 years before conducting this review).^{20,21,27-29} Because of this, older publications (9 studies with data collected before 2000) formed the bulk of available literature.

DISCUSSION

Problematic substance use behaviors among students at US pharmacy schools represent a significant issue for

the pharmacy profession and US healthcare system.¹ There is a relative dearth of recent research studies in the literature regarding the substance use behaviors of student pharmacists. This is the first study to comprehensively review the available literature on substance use behaviors among student pharmacists in the United States. Findings from this review highlight the existence of substance use behaviors in this population. Problematic alcohol use (hazardous and harmful use) was evident in student pharmacists and student pharmacists reported other drug use (eg, stimulants, opioids, marijuana, sedatives, hallucinogens, anxiolytics, heroin, and cocaine) within the past year.^{20,21,24,27,28} This literature review provides pharmacy school stakeholders (eg, school administrators, program coordinators, and program directors) with current and historical information regarding alcohol and drug use among student pharmacists. Given that student pharmacists are the professional pharmacists of tomorrow, emphasis should be placed on intervening on these problematic behaviors to prevent situations that may jeopardize future healthcare processes and outcomes.

Based on the DSM-5 criteria for a SUD, results from previous research suggest that some student pharmacists may meet the diagnostic criteria for mild or even moderate SUDs. Several studies reported data related to the "impairment of control over substance use criteria" (Table 1). For example, high percentages of student pharmacists reported consuming large quantities of alcohol (eg, binge drinking or hazardous consumption) in the most recent studies (those published after 2010).^{20,27,28} Furthermore, one study found that 3.2% of student pharmacists used prescription stimulants for nonmedical purposes during the past 5 months.²¹ In addition, student pharmacists also reported negative outcomes related to substance use (eg, receiving poor grades or evaluations because of their substance use),¹¹ which correspond to the impairment of control over social activity criteria. Student pharmacists who indicated substance use also were more likely to report driving under the influence or joining an intoxicated driver (ie, impairment of control over risky substance use criteria).²⁰ Collectively, these findings represent potential indicators for existing SUD in student pharmacists.

The evidence is mixed regarding the comparison between student pharmacists' substance use behaviors and other healthcare students' behaviors.^{11,16,20,25,29} For example, one study showed that student pharmacists were more likely to use substances (binge alcohol drinking and prescription drug use) than dental and allied health students.²⁵ However, Kenna and Wood (2004) found that student pharmacists had similar rates of alcohol use and lower rates of other drug use compared to nursing

students.¹¹ Baldwin and colleagues showed that student pharmacists had lower alcohol consumption in comparison to medical, nursing, and allied health students; however, student pharmacists were more likely to use tobacco when compared to medical, dental, and allied health students.¹⁶ Baldwin and colleagues also found that student pharmacists were more likely than other students to use prescription stimulants (amphetamines).¹⁶ However, Bossaer and colleagues found no significant difference in rates of prescription stimulant use among pharmacy, medical, and respiratory therapy students.²⁹ Overall, it is difficult to draw firm conclusions from these findings about whether pharmacy students engage in more or less problematic substance use behaviors compared to other health professional students. Furthermore, the methodological issues discussed earlier (eg, inconsistent definitions and measurement of substance use) hinder comparisons across studies.

Current evidence regarding student pharmacists' problematic substance use calls for the implementation of preventive and treatment strategies in pharmacy schools. A plausible prevention strategy centers on strengthening students pharmacists' training about SUD and negative outcomes. The American Association of Colleges of Pharmacy (AACP) states that pharmacy schools and colleges are responsible for ensuring that student pharmacists are equipped with the skills and knowledge about substance use and SUDs.³⁶ AACP recommends that all pharmacy schools provide professional SUD-related education in both entry-level and continuing-education programs.³⁶ Substance use can be addressed in coursework and/or cocurricular activities provided by pharmacy schools. Such educational and training programs may help student pharmacists identify signs and symptoms related to problematic substance use among themselves and their colleagues.³⁷

Pharmacy schools also may assist student pharmacists who are at risk of developing or have SUDs by implementing disease-state evaluation, referral programs and interventions that facilitate recovery.³⁶ Student services departments can play a role by assessing and evaluating students they suspect of having a problematic substance use behavior. For example, the Student Assistance Program at Auburn University conducts evaluations of students with problematic substance use.³⁸ Based on evaluation results, students are referred for further evaluation and/or treatment. The Pharmacists Recovery Network website (www.usaprn.org) provides a SUD educational network and a list of available recovery assistance programs by state.³⁹ The role of this network is to provide individuals who seek recovery with confidential assistance and support. Educating students about such

programs might increase their willingness to seek help and/or refer colleagues who need help.³⁹ In addition, general interventions aimed at preventing substance use problems among college students also may be applicable to student pharmacists.⁴⁰⁻⁴² The Brief Alcohol Screening and Intervention for College Students (BASICS) is an example of a program that has been found to help general college students with alcohol use problems.⁴³⁻⁴⁵ The BASICS was developed to increase students' motivation to change their drinking habits and to provide them with behavioral skill training on how to control alcohol drinking and how to manage daily stress.⁴⁴ Such programs could be modified to address factors associated with student pharmacists' substance use (eg, stress, self-treatment) and implemented to help student pharmacists prevent and/or recover from SUDs.

CONCLUSION

Previous studies suggest that student pharmacists engage in problematic substance use and may be at risk of developing substance use disorders. These findings highlight the need for programs/interventions to address substance use in schools and colleges of pharmacy. Future research should be conducted to gain a better understanding of substance use and SUD developmental processes among student pharmacists. For example, an annual national survey assessing attitudes, motivations, and substance use behaviors among student pharmacists may provide representative data for assessing the change in substance use over time, and help to identify mutable factors contributing to substance use.⁴⁶ Findings from such research may help pharmacy school administrators and stakeholders prevent substance use issues among students and aid students in need of substance use services.

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