

The Prevalence and Patterns of Substance Abuse Among Nurse Anesthesia Students

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The purpose of this study was to assess the prevalence, demographic factors, outcomes, and preventative measures for substance abuse among nurse anesthesia students over a 5-year period from 2008 to 2012. An electronic survey was sent to 111 program directors of accredited nurse anesthesia programs in the United States. Twenty-three programs (response rate = 21.7%) reported data related to 2,439 students. Sixteen incidents of substance abuse were reported for a 5-year prevalence of 0.65%. Opioids were the most frequent drug of choice (n = 9). The programs identified no predisposing risk factors in 50% of the incidents. For the students, reported outcomes included voluntary entry into treatment (n = 10), dismissal from the program (n = 7), loss of nursing license (n = 2), and 1 death. Pre-enrollment back-

ground checks and drug testing for cause were the most commonly reported screening practices. The most frequently reported prevention strategy was wellness promotion education. The prevalence was lower among student registered nurse anesthetists, as compared with certified registered nurse anesthetists. Although additional studies are necessary to verify this finding, an opportunity might exist for programs to be proactive in assessing risk postgraduation. Future studies evaluating the effectiveness of wellness promotion efforts might lead toward a standardized, best practice approach to risk reduction strategies.

Keywords: CRNA, nurse anesthesia students, substance abuse.

It has been well documented that anesthesia providers are at risk for diversion and abuse of controlled substances.¹⁻⁴ The majority of studies that have been conducted have examined prevalence rates, implications, and outcomes of substance abuse in anesthesiologists, while few have studied certified registered nurse anesthetists (CRNAs). Although the 1999 landmark study by Bell and colleagues² did evaluate substance misuse among CRNAs, few studies have reconsidered this issue for CRNAs since then, with even fewer studies involving student registered nurse anesthetists (SRNAs). It has been noted that risks for misuse are high for nurse anesthesia students in their formative educational years, highlighting the need to gain insight into the patterns of misuse among this group of healthcare providers.⁵ Ross and colleagues⁶ surveyed nurse anesthesia school program directors about SRNA substance abuse; however, this study is more than 15 years old.

Background

This literature review examined the prevalence of substance abuse, commonly abused drugs, predisposing and demographic factors, and characteristics of substance abuse for anesthesia providers. Included were randomized control trials, descriptive studies, and other articles published between 1990 and 2013.

• **Prevalence Rates.** In a 1997 poster abstract, Ross and colleagues presented results from a survey of nurse anesthesia school program directors that examined substance abuse among SRNAs between 1991 and 1996 and reported a prevalence of 4.87 per 1,000 students. Programs located in areas with populations of less than 50,000 were least likely to have an incident, and programs in areas with populations between 50,000 and 250,000 were most likely to have an incident of abuse.⁶

In contrast, Bell and colleagues² documented a higher prevalence rate of 9.8% for controlled substance misuse in CRNAs. In their mailed, self-administered survey of 1,709 actively practicing CRNAs, the researchers evaluated the prevalence of substance abuse and determined the influence of relevant covariates. Respondents were predominantly urban-dwelling (63%) females (54%) of 36–40 years of age from the Midwest and had practiced between 11 and 15 years. Of the 167 respondents acknowledging drug misuse, 62.9% were male with 6 to 10 years of practice experience. The majority (64.1%; n = 107) reported polydrug misuse. In contrast to data showing opioids as the most misused substance by anesthesia providers, Bell et al² reported that the most misused drugs in their sample were (in rank order from most to least) benzodiazepines, inhalation agents, propofol, opioids, ketamine, agonist-antagonists, and bar-

biturates.⁷ Bell et al² concluded that drug misuse was a significant and serious problem among CRNAs.

In their review article, Wright and associates⁴ reported on an unpublished replication study that was conducted by Bell et al in 2006. The findings of the replication study were similar to the original study but with an overall increase in the rate of misuse of opioids and propofol. It indicated that the majority of participants who reported misuse had been in practice 10 to 20 years, but a subset of participants in the second study admitted to misuse in their first 3 to 5 years of practice.⁴ In an effort to better identify risk factors and to design prevention strategies during training programs, based on their review, Wright et al⁴ recommended further research into the factors that might predispose SRNAs and anesthesiology residents to substance abuse.

• **Factors Related to Substance Abuse.** Stress among nurse anesthesia students is well documented in literature. A study by Perez and Carroll-Perez⁸ examined the perception of students' stress in nurse anesthesia programs and the availability of stress management resources. Of 1,504 student respondents, 73% reported they were in the major life crisis category as measured by the Social Readjustment Rating Scale (SRRS), putting them at increased risk for illness, injury, or other adverse outcomes. In addition, 78% of students reported that their program did not have stress management resources available. Of those students who indicated a stress management program was available in their school, only 8% reported participating in it. A major limitation of this study was that perceived stress levels were not reported by the participants' age, gender, or other demographic characteristics.

To examine perceived stress and burnout, Chipas and McKenna⁹ surveyed nurse anesthesia students, as well as practicing CRNAs, in clinical, education, administration, and military settings. A total of 7,537 surveys were returned of which 1,130 were students. The manifestations of stress, including physical symptoms and self-assessment, were measured using a 10-point Likert scale, in which 10 represented the highest perceived level of stress. The students' self-assessed mean stress score was 7.2, as compared with 6.2 for educators, 5.1 for administrators, 4.9 for military, and 4.3 for staff CRNAs. The authors did not indicate whether these differences were statistically significant but did cite several associated factors that place students at a higher risk of stress, as compared with graduates. These factors include the burden of financial strain, transition into a student role, pressure to learn and complete school, decreased self-esteem, and diminished time with family and friends.

Domino and colleagues¹⁰ retrospectively studied the risk factors for substance abuse and relapse for 292 healthcare providers enrolled in a chemical dependency treatment and monitoring program. The data did not

include nurses, residents, or students. Over a 10-year period, 25% of the healthcare providers had at least 1 relapse. Risk factors for relapse included the use of a potent opioid, the presence of a coexisting psychiatric disease, and a family history of substance abuse. Moreover, the presence of more than one of these factors markedly increased that risk, and the risk of subsequent relapse increased with each relapse. The risk of relapse was increased in the nonphysician group as compared with physicians. Among physicians, anesthesiologists had an increased risk as compared with other specialties. Further, anesthesiologists who returned to anesthesia practice had an increased risk of relapse, as compared with anesthesiologists who left the specialty.

• **Commonly Abused Drugs.** In recent years, propofol has been more frequently noted as a drug of abuse. In 2007, Wischmeyer and colleagues⁵ conducted a comprehensive survey of academic anesthesiology program directors with an emphasis on the patterns and prevalence of propofol abuse among attending physicians, residents, CRNAs, and anesthesia technicians. The data showed that at least 1 incident of propofol abuse or diversion occurred in 18% (n = 23) of anesthesia departments affiliated with an academic program. Further, the 10-year incidence of propofol abuse was 10 per 10,000 providers, or 0.1%, which was notably higher than the previous reports that indicated a propofol abuse incidence of 0.02%.¹¹ No controls were in place for the dispensing of or accounting for propofol in the clinical area in 71% of the programs. A significant association was noted between the lack of dispensing control and the prevalence of propofol abuse, suggesting that tightly regulated dispensing systems may be an opportunity to prevent or deter propofol abuse.⁵

The study also examined outcomes for those who abused propofol. Among all anesthesia providers who abused propofol, the mortality rate was 28%, but a higher rate of 38% was reported for anesthesia residents. While this study offered significant insight into the abuse of propofol by anesthesia personnel, it also had limitations. The authors included CRNAs in the study; however, the authors admit that they crudely estimated the number of CRNAs for their denominator of 2,520 and made no mention of information pertaining to SRNAs. The survey relied on the recollection of program chairpersons who may or may not have been in place for the 10-year study period, so they may not have been able to verify the record-keeping accuracy over that time period.

A systematic review of 45 relevant articles on the topic of propofol abuse by Wilson, Canning, and Caravati¹² provided further insight into the abuse potential of propofol through its addictive characteristics such as the occurrence of tolerance, dependence, withdrawal symptoms, and death. The reviewed articles included research articles, case reports, a cross-sectional and prospective

trial, and review articles. The authors did not indicate the specific target populations in their review but concluded that the evidence warrants a change in propofol categorization to a controlled substance.

• **Outcomes of Substance Abuse.** Using a survey sent to all physician anesthesiology training programs (n = 169), Collins and colleagues¹³ explored chemical dependency treatment outcomes for anesthesia residents. The survey questions pertained to the treatment and outcomes of chemically dependent residents from 1991 to 2001. Data from the 111 responding programs (representing 3,569 residents), demonstrating that 80% of the programs had at least 1 chemically dependent resident and 19% of the programs reported at least 1 fatality during that 10-year period. A total of 230 impairment cases resulted in a 10-year prevalence of known, active chemical dependency of 0.87%. Of residents who were previously treated, 16% left medicine and 84% continued postgraduate training. Of those, 92% pursued anesthesia, while 8% entered other specialties. However, only 60% of those returning to anesthesia training actually completed the program.

• **Purpose of the Study.** The primary purpose of this study was to assess the prevalence of substance abuse among SRNAs between 2008 and 2012. Additional aims of the project were as follows: (1) describe the common drugs of abuse; (2) identify the related demographic factors associated with substance abuse; (3) explore the outcomes related to substance abuse; and (4) identify the processes used in anesthesia programs to screen students for substance abuse and to promote wellness among their students.

Materials and Methods

• **Design.** The institutional review board (IRB) at the University of Detroit Mercy, Detroit, Michigan, approved the project. This cross-sectional, retrospective study employed an electronic survey sent to the program directors (PD) of the 113 accredited nurse anesthesia programs in the United States. The survey (Figure) asked PDs to consider responses based on current cases, as well as historical incidents, over a 5-year period. A 5-year period was chosen to increase the likelihood that faculty would recall incidents and that the PD responding to the survey was in that role at the time of the student incident.

Survey items inquired about known incidents of substance abuse including the drug(s) abused and student outcome (e.g., termination, readmission, loss of licensure, or death). The term, *substance misuse*, as defined by Bell et al,² guided this study. The definition of period prevalence used was the number of affected persons (substance abuse incidents) at any point in time during the specified period divided by the number of persons in the population (admitted students).¹⁴ Demographic data collected included the number of students admitted during the 5-year period to determine estimated de-

nominators, age, gender, ethnicity, and level of student (by months) in the program. The survey also asked how the incident was identified and what interventions were employed. Finally, the survey asked the PD to report existing processes pertaining to prevention and detection including drug testing, background checks, and education. The survey was investigator developed through the adaptation of the previously published surveys used by Wischmeyer et al⁵ and Collins et al.¹³ The survey was reviewed by 2 well-known PDs with extensive research experience to elicit feedback regarding the appropriateness of the tool used to gather the intended data. The reviewers recommended no substantial changes.

• **Data Collection.** A cover letter describing the study and an invitation to participate were sent by electronic mail to all PDs. In the e-mail, the PDs were informed that their consent to participate would be implied by their completion of the questionnaire. Their e-mail addresses were obtained from contact information that was publicly available on program websites. The invitation e-mail contained a link to the electronic survey. A follow-up, reminder e-mail including the survey link was sent 2 weeks after the first e-mail.

Results

• **Prevalence and Demographic Data.** Of the 113 e-mailed invitations to participate, 1 address was undeliverable, and 1 program was in operation for less than 5 years. Thus, a total of 111 programs were available to participate in the study. Of the 111 programs, 23 (21.7%) PD responses contained complete data for the prevalence and demographic analyses. However, an additional 24 PDs (a total of 47 or 42.3%) responded to portions of the survey offering responses to the open-ended questions related to screening procedures and prevention strategies, so those responses were considered for those research questions.

Among the PDs providing complete data, 2,439 students were admitted over the 5-year study period (Table 1). Fourteen of the 23 programs (60.8%) that provided data identified at least 1 incident of student substance abuse, and 2 programs reported 2 incidents for a total of 16 incidents. This represents a 5-year prevalence of 0.65% for the 2,439-admitted students. Of those 16 students reported to have abused substances, the majority were female (50%; n = 8 with 1 incident not indicating gender), were white (88%; n = 14), were between 20 and 29 years of age (56%; n = 9), and had completed between 13 and 24 months (69%; n = 11) of their academic training. Clinical staff discovered the majority of incidents (Table 2). While more incidents involved female students, the proportion was greater for males. According to the 2012 annual report of the National Board of Certification and Recertification for Nurse Anesthetists, nationally, 36.5% of new graduates were male. While the proportion of substance-abusing males in this study

1. How many students have been admitted to your program over the past 5 years (calendar years, 2008–2012)? ____
2. How many males were admitted (2008–2012)? ____
3. How many students GRADUATED from your program over the past 5 years (calendar years 2008–2012)? ____
4. How many males graduated (2008–2012)? ____
5. In calendar years, 2008–2012, HOW MANY individual students were identified to be misusing or abusing drugs? (This question includes street or illicit drugs, prescribed medications, and alcohol)? Enter a whole number (or zero).

Please answer the questions on this page with regard to the student(s) discovered to be abusing substances.

6. How many of these students were in the following age groups at the time of discovery?
 - 20–29
 - 30–39
 - 40 or more
7. How many of these students were male? ____
8. How many students were in each racial or ethnic category?
 - White
 - African American
 - Asian American
 - Hispanic
 - Arabic or Middle Eastern
 - Multiracial
 - Other
 - Unknown
9. How many were discovered at each of these periods in the curriculum?
 - 0–12 months
 - 13–24 months
 - Beyond 24 months
10. How many students were identified through each mechanism?
 - Self-report
 - Discovered by random testing
 - Discovered by clinical faculty or staff by behavior/impairment
 - Discovered by didactic faculty or staff by behavior/impairment
 - Discovered unresponsive
11. How many students had each drug as their primary drug of abuse?
 - Opioids
 - Propofol
 - Ketamine
 - Other induction drugs
 - Benzodiazepines
 - Nitrous oxide
 - Volatile agent
 - Alcohol
 - Cannabis
 - Cocaine
 - Amphetamine
 - Polydrug use
 - Other
12. In retrospect, did the program recognize the presence of predisposing risk factors? How many times did each apply?
 - Psychiatric disease
 - History of drug misuse/abuse
 - Family history of drug misuse/abuse
 - Ineffective coping skills
13. How many times did each of these outcomes occur?
 - Dismissal from the program
 - Voluntary enrollment into a treatment program
 - Completed treatment, returned to the program, and graduated
 - Completed treatment, returned to the program, but did not graduate
 - Completed treatment but did not return to the program
 - Lost RN License
 - Incarcerated
 - Died
 - Lost to follow-up
 - Other
14. Which screening procedures are in place at your program? Check all that apply.
 - Pre-enrollment drug testing
 - Pre-enrollment criminal background checks
 - Random drug testing during program
 - Drug testing for cause during program
 - Risk factor assessments
 - None
 - Other
15. Beyond classroom teaching, in what way(s) does your program promote wellness?
16. Please feel free to provide any other information you feel is relevant to the experience of your program regarding substance abuse or misuse by students.

Figure. Survey Instrument

(47%) was higher than the proportion of males for all admitted students (34%), this difference was not statistically significant ($\chi^2 = 0.99$; $df = 1$; $P < .05$).¹⁵

• **Drug of Choice, Risk Factors, and Outcomes.** Opioids were the most frequent drug of choice ($n = 9$), followed by alcohol ($n = 4$), cannabis ($n = 3$), benzodiazepines ($n = 1$), cocaine ($n = 1$), and polydrug use ($n = 1$). There were no reported incidents of abuse with propofol, ketamine,

inhaled agents, or any other substances. Fifty percent ($n = 8$) of the students with an abuse incident had no known risk factor for substance misuse. Three of the impaired SRNAs had a personal history of substance abuse, and 3 had a family history of substance abuse (Table 3).

For the students, the most common outcomes of substance abuse were voluntary entry into treatment ($n = 10$), dismissal from the program ($n = 7$), and loss of

Total number admitted	Average number admitted/program/year	Number of graduates	Reported incidents of substance abuse
2,439 total;	20.3	2,093	16
1,598 females (66%);	Range 8-66	Retention 85.8%	5-year prevalence 0.65%
841 males (34%)	Median 19.9		

Table 1. Number of Students in the Study

Response	Frequency	Percent (%)
Age		
20-29	9	56.25
30-39	5	31.25
≥40	1	6.25
Not reported	1	6.25
Gender		
Male	7	43.75
Female	8	50.00
Not reported	1	6.25
Ethnicity		
White	14	87.50
Others	0	0
Not reported	2	12.50
Level in program (months)		
0-12	2	12.50
13-24	11	68.75
>24	2	12.50
Not reported	1	6.25
Means of discovery		
Clinical faculty/suspected behavior	8	50.00
Discovered unresponsive	3	18.75
Random test	2	12.50
Not reported	2	12.50
Didactic faculty/suspected behavior	1	6.25
Self-reported	0	0

Table 2. Characteristics of Reported Cases of Substance Abuse

nursing license (n = 2). Of the 6 who completed treatment, 4 returned to the program, and 3 of whom graduated (Table 3). Four students were lost to follow-up, and 1 student died.

- **Screening Procedure Data.** Forty-seven PDs responded to questions related to the screening procedures used for substance misuse. Drug testing for cause (suspicion) and pre-enrollment background checks were the most commonly reported practices, followed by pre-enrollment drug testing. Other screening practices reported included risk factor assessments and random drug testing. All respondents reported that at least one of these procedures was in place (Table 4).

- **Wellness Promotion Practices.** Eighteen of the 47

Drug abused	
Opioids	9
Alcohol	4
Cannabis	3
Benzodiazepines	1
Cocaine	1
Polydrug	1
Not reported	1
Propofol	0
Ketamine	0
Amphetamines	0
Other induction drugs	0
Nitrous oxide (N ₂ O)/volatile agents	0
Risk factors identified retrospectively	
None reported	8
Personal history of substance abuse	3
Family history of substance abuse	3
Ineffective coping skills	2
Psychiatric disease	0
Outcomes	
Voluntary enrollment into treatment	10
Dismissed from program	7
Lost to follow-up	4
Completed treatment/returned/graduated	3
Completed treatment/did not return	2
Lost RN license	2
Completed treatment/returned/did not graduate	1
Died	1
Not reported	1
Incarcerated	0

Table 3. Drugs Abused, Risk Factors, and Outcomes

PDs who provided partial information reported on their wellness promotion practices that were in place for SRNAs (Table 5). Several themes were identified. Educational offerings (n = 7) were identified by PDs including 2 that specifically mentioned the use of the American Association of Nurse Anesthetists (AANA) *Wearing Masks* video series. Two respondents indicated the involvement of CRNAs who were in recovery speaking to students during their educational training, and 2

Screening procedures	Number of programs indicating a screening procedure	Percent of programs
Drug testing for cause during program	23	48.94%
Pre-enrollment criminal background checks	20	42.55%
Pre-enrollment drug testing	14	29.79%
Random drug testing during program	7	14.89%
Risk factor assessments	5	10.64%
Other	2	4.26%
None	0	0.00%

Table 4. Screening Process in Place (program, n = 47)

respondents referred to extending education to students' significant others. One respondent indicated that the program has begun requiring students to complete the AANA Learn modules on wellness education. Meanwhile, 8 respondents indicated general "wellness activities," and 2 mentioned involvement in the wellness efforts of the professional association. Faculty support, or "open door policy," was mentioned 6 times, and 1 respondent indicated that the faculty serves as "role models" for healthy living styles. One respondent indicated the use of a wellness screening self test for risk factors that was taken by the students prior to beginning clinical rotations.

Discussion

This study provided current data on the substance abuse prevalence and patterns among SRNAs from 2008 to 2012. The data from this survey revealed a 5-year prevalence of substance abuse among SRNAs of 0.65%, which was slightly higher than the previously reported 5-year prevalence of 0.487% by Ross and colleagues⁶ and might be higher than the prevalence among anesthesia residents reported by Collins et al.¹³ It should be noted that the study by Collins et al.¹³ reported a 10-year prevalence of 0.87%, so a direct comparison to a 5-year study cannot be assumed.

As compared with the reported substance misuse of 9.8% among 1,709 practicing CRNAs indicated by Bell et al.,² the prevalence in this study was considerably lower. While the rate found in the present study is relatively low, any prevalence of substance abuse among students is not acceptable. Perhaps the important aspect of the findings lies in the contrast in rates between students and CRNAs. This difference may be partially explained by 3 factors. First, Bell et al.² asked participants about past, recent, and current misuse rather than defining a period of prevalence, so their findings may not represent current misuse. Second, the data collection method between this study and Bell et al.² was significantly different. For example, in this study, the PDs were asked about substance abuse based on documentation, while Bell² used a self-reporting method. Third, misuse may be more likely to develop after graduation as practical knowledge, familiarity, and access to drugs increases. This might be

Wellness promotion practice theme	Number of times indicated
Wellness activities	8
Educational offerings	7
Faculty support	6
Institutional counseling	2
Ample vacation time	2
Education for students' significant other	1
Wellness inventory assessment	1
Mentor involvement	1
Student "morale and welfare officer"	1

Table 5. Themes for Program Wellness Promotion Efforts

supported by the finding in this study that the majority of students reported to have abused substances were less than 30 years of age; however, Bell et al.² found that the majority of those reporting substance misuse were older than 30 years of age and practicing for more than 11-15 years. This raises a concern that students who were not identified as substance abusers may develop this behavior over time. Further, it may be that the presence of the watchful eyes of the CRNA instructor prevents diversion on the part of students. Additional exploration into these differences in patterns between students and CRNAs as they progress in their practice is warranted.

The drug class most frequently abused in this study was opioids, while Bell et al.² reported that benzodiazepines and nitrous oxide were more commonly abused. In contrast to the previous reports of propofol abuse for anesthesia providers by Wischmeyer and associates,⁵ the current study revealed no incidents of propofol abuse. This may reflect a change in trends for all anesthesia providers who abuse substances or a difference in drug of choice between SRNAs and the anesthesia providers in those studies or improved monitoring and control of propofol by anesthesia departments.

The findings would seem to contradict the higher levels of perceived stress among students reported by Chipas et al.,⁹ if stress is to be considered a predisposing factor for substance abuse. The impact of stress among students may manifest itself in areas of wellness, other

than substance abuse. In half of the reported substance abuse incidents, a risk factor was not identified by PDs. Personal or family histories of substance abuse or ineffective coping skills were identified in the remaining incidents. This may be related to ineffective screening mechanisms in place by programs, poor recollection, or reluctance to report. It may also indicate that students began abusing substances after entry into the program when predisposing factors were not present.

The most commonly cited screening mechanisms in use by the programs might not detect those at risk, unless the student has a criminal background indicating substance abuse or a positive drug test before enrollment. Only 5 PD respondents indicated the use of a risk factor assessment for students. Future research into the effectiveness of screening mechanisms is warranted. In general themes, the respondents mentioned processes in place to promote wellness with the most frequently employed strategies being wellness activities, educational offerings, and faculty support.

For this study, certain limitations exist. The instrument limited the analysis to descriptive data, while correlative data might have provided more insight. Because of this limitation, no psychometric assessments were performed to assure further validity or reliability. While the number of admitted students reflected in the survey is considerable (2,439), the response rate of 21.7% limits the ability to generalize the demographic findings to all nurse anesthesia education programs. A standardized approach to reporting substance abuse by nurse anesthesia PDs would provide additional data for research. In addition, this study relies on documented incidents of substance abuse and may be missing undocumented or unnoticed incidents, so the actual prevalence could be higher. Despite these limitations, the findings from this study do provide important, current data on substance abuse among SRNAs.

Substance abuse among SRNAs is a concern for anesthesia educators. The findings in this study suggest the prevalence has not changed dramatically since first reported by Ross et al⁶ in 1997 and may be low, as compared with CRNAs. The data provide insight into opportunities for future research. For example, future surveys should be configured to provide correlation data, in addition to descriptive data, to identify any connections that may exist between the likelihood of abuse and other factors such as demographics. Direct survey of students may allow for a closer comparison of previously published studies involving CRNAs, and studies evaluating the effectiveness of wellness promotion strategies might lead toward a standardized, best practice approach. As more in-depth data evolves, programs may be better able to identify the most effective means of screening for

at-risk applicants or students. If future studies were able to identify the effectiveness of wellness and prevention strategies, program faculty could be more proactive in promoting wellness in their students as they transition from student to practitioner.

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