Chemical Substance Use Among Radiologic Science Professionals: A Pilot Study

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Objective: No formal study has been done to document the extent of chemical substance use among radiologic science professionals. In this study, baseline data were acquired on prevalence, use patterns and behaviors associated with chemical substance use among a group of technologists that included nuclear medicine, radiography, diagnostic medical sonography, CT, MRI and radiation therapy.

Methods: Copies of a written questionnaire were hand distributed to technologists at five hospitals in a metropolitan statistical area. The survey tool sought prevalence, use and behavioral data in the following drug categories: alcohol, tobacco, sedatives, tranquilizers, stimulants, analgesics, marijuana, inhalants, cocaine, hallucinogens and heroin. Completed surveys were collected in drop boxes and responses were entered into a computer database for analysis.

Results: The response rate for this study was 55.8%. Of this group, 83.5% had used at least one type of drug in their lifetime, and all types of drugs noted on the survey had been used. The top four drug types used, in descending order of use, were alcohol, tobacco, analgesics and marijuana/hashish. Respondents appeared to have the least success in trying to cut down on cigarette use.

Conclusion: This study confirms that radiologic science professionals are users of both licit and illicit chemical substances, and that behavior is influenced by their use. Additional study is warranted to draw a more representative picture of chemical substance use by the profession as a whole and its effects on work-related activities.

Key Words: chemical substance use; radiologic science professionals

J Nucl Med Technol 1996; 24:59–64

For some time, chemical substance use, abuse and dependency have been identified collectively as a major health problem in the U.S. In *Healthy People 2000: National Health Promotion and Disease Prevention*, the federal government cited tobacco and "alcohol and other drugs" in two of eight priorities for health promotion and disease prevention for this decade (*1*). In the 1980s, the National Institute for Drug Abuse (NIDA) recognized that workplace drug use and its consequences were important components of the overall drug issue. This recognition was reinforced by data such as a 1988 study that showed 70%, or more than 10 million people, reporting current illicit drug use were employed (*2*). In a 1991 radiologic science news medium, radiologic technologists spoke out about having chemical substance problems and suffering punitive job-related consequences (*3*). To date, no known formal study had documented the extent of chemical substance use in this profession. To that end, the authors set out to acquire specific baseline data on prevalence and frequency of chemical substance use and some associated behaviors among radiologic science professionals.

MATERIALS AND METHODS

A detailed questionnaire was developed to acquire specific information on prevalence and frequency of chemical substance use and on behaviors and feelings associated with usage among radiologic science professionals. This tool was adapted from the Substance Abuse and Mental Health Services Administration's National Household Survey on Drug Abuse (NHSDA). The NHSDA has been used since the late 1970s and provides an established resource for data comparisons. Like the NHSDA, the authors' tool asked questions about the following drug categories: tobacco, alcohol, sedatives, tranquilizers, stimulants, analgesics, marijuana, inhalants, cocaine, hallucinogens and heroin.

Employees of five hospital radiology departments in a metropolitan statistical area comprised the study population. It included a total of 249 technologists in radiography, CT, MRI, sonography, nuclear medicine and radiation therapy, and covered all personnel regardless of percentage of work effort or shift. In winter 1994, the surveys were hand distributed to technologists at their workplaces. The authors explained to the staff the survey's purpose, the emphasis on voluntary participation, how long they had to complete the survey, and where to

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TABLE 1
Respondent Demographic Profile

	Characteristic	n	%
Sex	Male	36	25.9
	Female	101	72.7
	No response	2	1.4
Marital status	Married	87	62.6
	Sep./Divorced	15	10.8
	Never Married	35	25.2
	Widowed	2	1.4
Work status	≤35 hrs per wk	15	10.8
	Full-time	124	89.2
Job history (last 5 yr)	1 job	2	1.4
	2 jobs	79	56.8
	3 jobs	37	26.7
	4 jobs	12	8.6
	5 jobs	6	4.3
	6 jobs	2	1.4
	No response	1	0.7
Lifetime use of substances	Never used	23	16.5
	Used ≥1 substance	116	83.5
	Total	139	

return it. Drop boxes were placed at certain locations in the departments and were secured to prevent tampering. At the end of the survey period, the authors collected the drop boxes and merged all the surveys to create one set of responses. Each survey's answers were hand entered into a database for subsequent manipulation by a statistical software package.

RESULTS

One-hundred thirty-nine surveys were completed out of 249, for a 55.8% response rate. General demographic characteristics of the respondents are profiled in Table 1. Figure 1 shows a breakdown of chemical substance use (excluding childhood sips, puffs, etc.) by number of drug types used in their lifetimes. It shows 23 (16.5%) never used any of these substances in their lifetimes. It also shows that a majority of drug users (51.7%)

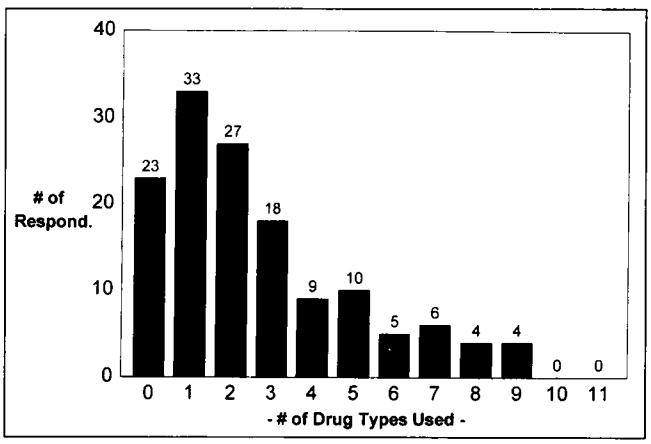

FIGURE 1. Number of drug types used in lifetime.

TABLE 2
Comparisons of Lifetime Alcohol and Tobacco Use

	Study population			
	n	%	National (%)*	Regional (%)*
Alcohol	106	76.3	83.6	80.3
Cigarettes	62	44.6	71.2	70.6
Smokeless tobacco	8	5.8	12.8	14.2

*National data were collected in 1993 and included regional data.

have used one (n = 33) or two (n = 27) drugs. Of the 33 respondents who reported using only one drug during their lifetime, they identified four different drug types–alcohol, tobacco, tranquilizers and analgesics–with alcohol being the most common. Of those who reported using two drug types in their lifetime, six different combinations were identified, with tobacco and alcohol being reported by the majority of this group. Of those who reported using three different drug types in their lifetime, five different drug combinations were identified. The two following combinations–tobacco, alcohol and marijuana or tobacco, alcohol and analgesics–were used by the majority of this group.

Prevalence of each of the drug types was also determined and is compared in Tables 2 and 3 to the most recent national and regional population data available (*4*). The southern region included the following: Delaware, Maryland, District of Columbia, Virginia, West Virginia, Kentucky, Tennessee, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Arkansas, Oklahoma and Texas. It should also be noted that for comparisons of the study population with national and regional groups, data were collected from the study population in early 1994, and national and regional data were collected in 1993, so comparisons between them are not temporally exact. (National and regional data were collected in 1994, but results are not yet available.)

TABLE 3
Comparisons of Lifetime Nonmedical Chemical Substance Use

	Study population		National	Regional
	n	%	(%)*	(%)*
Analgesics	46	33.1	5.8	5.3
Marijuana/hashish	43	30.9	33.7	31.2
Tranquilizers	27	19.4	4.6	4.2
Stimulants	25	18.0	6.0	5.2
Cocaine	22	15.8	11.3	9.4
Hallucinogens	15	10.8	8.7	7.6
Sedatives	13	9.4	3.4	3.3
Inhalants	6	4.3	5.3	4.7
Heroin	2	1.4	1.1	0.8
Crack	1	0.7	1.8	1.7

*National data were collected in 1993 and included regional data

TABLE 4
Behaviors Exhibited by Respondents Who Drank Over the Past 12 Months

Behavior exhibited	Number of Respondents
Awakened unable to remember some of the things I have done while drinking the day before	10
Sometimes got high or a little drunk when drinking by myself	10
Felt aggressive or cross while drinking	8
Got into heated argument while drinking	7
Tossed down several drinks pretty fast to get a quicker effect	7
Spouse, boy/girlfriend or relative told me I should cut down on my drinking	2
Afraid I might be an alcoholic or might become one	2
Once I started drinking, it was difficult to stop before becoming completely intoxicated	2
Had a quick drink or so when no one was looking	2
Sometimes kept on drinking after promising myself not to	2
Stayed away from work or school because of hangover	1
Often took a drink first thing in the morning	1
Hands shook a lot after drinking the day before	1
Was high or a little drunk when on the job or at school	0
Lost a job, or nearly lost one, because of drinking	0
Stayed drunk for more than one day at a time	0

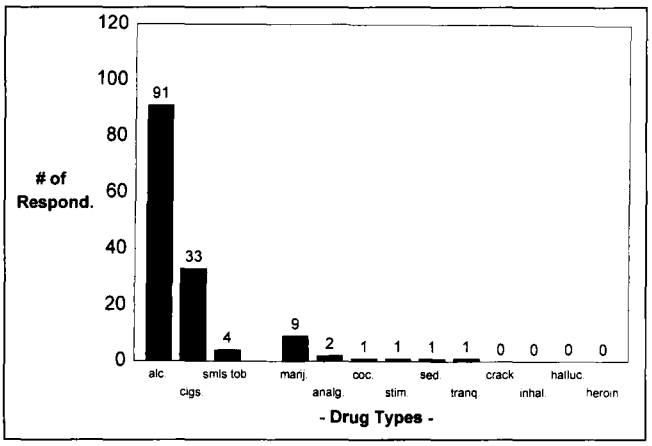

FIGURE 2. Drug use over past 12 mo for specific drug categories.

Alcohol, the top drug choice, was reported to have been used by 106 (76.3%) of the respondents in their lifetime. Table 2 compares this use to national and regional data (*4*). Of this group of 106, 85.9% had consumed alcohol in the past 12 mo, 80% had done so in the past 6 mo, and 66.9% had an alcoholic drink in the past 30 days. Of those who reported drinking in the past 30 days, they drank on an average of 5.2 days, and averaged 2.3 drinks per day. Thirty respondents had 5 or more drinks in one day in this same time period. Those who had alcohol in the past 12 mo were also asked about certain behaviors. Table 4 identifies these behaviors and their frequency of occurrence.

Sixty-two of the 139 respondents (44.6%) reported cigarette use sometime during their lives. Over half of this subgroup also reported cigarette use in the past yr and in the past 6 mo. Of those who smoked in the past 30 days, 68.0% smoked between a half a pack and one pack per day. Eight of 139 (5.8%) respondents reported lifetime smokeless tobacco use, with half of them using it in the past year, and over one-third using it in the past 30 days. Table 2 compares this use with national and regional data (*4*).

Nonmedical drug use was determined for each of the remaining drug categories. Nonmedical was defined as "on your own, either without your own prescription from a doctor, or in greater amounts than prescribed, or more often than prescribed, or for any reason other than a doctor said you should take them." Table 3 identifies nonmedical use sometime during their lifetimes for the study population, national and regional groups (*4*). The study population's past yr alcohol, tobacco, and nonmedical drug use of the remaining categories is identified in Figure 2. Complete data from the 1993 national study were not yet available for each category, but information was provided for alcohol, marijuana, and cocaine for an abbreviated comparison. Ninety-one (65.5%) respondents used alcohol in the past 12 mo, compared to 66.5% nationally and 60.0% regionally (*4*). Nine (6.5%) respondents used marijuana/hashish over the past 12 mo, compared to 9.0% nationally and 8.6% regionally (*4*). Also, 1 respondent (0.7%) used cocaine over the past 12 mo, compared to 2.2% nationally and 1.6% regionally (*4*).

Those who had used at least one type of drug in their lifetimes were asked to respond to a series of questions about behaviors typically associated with drug abuse or dependence. Figure 3 summarizes behaviors over the past 12 mo regarding the number of respondents who consciously tried to cut down on use of particular drug types, the number who felt dependent upon specific drug types, and the number who were unable to cut down on their use. Figure 4 identifies the number of respondents who had used particular drug types while at work over the past 12 mo. Table 5 summarizes the frequency of personal actions or feelings that respondents experienced over the past 12 mo as a result of using tobacco, alcohol or other drugs at any time in their lives. The table also indicates the drug(s) respondents associated with each item. Table 6 presents the number of respondents exhibiting certain general behaviors over the past 12 mo.

When questioned about treatment, two respondents stated during the past 12 mo they had received treatment through an employee assistance program, and one had been treated for drug use through a self-help group. Seven respondents indicated they had been required by their employers to take a drug test during the past 12 mo.

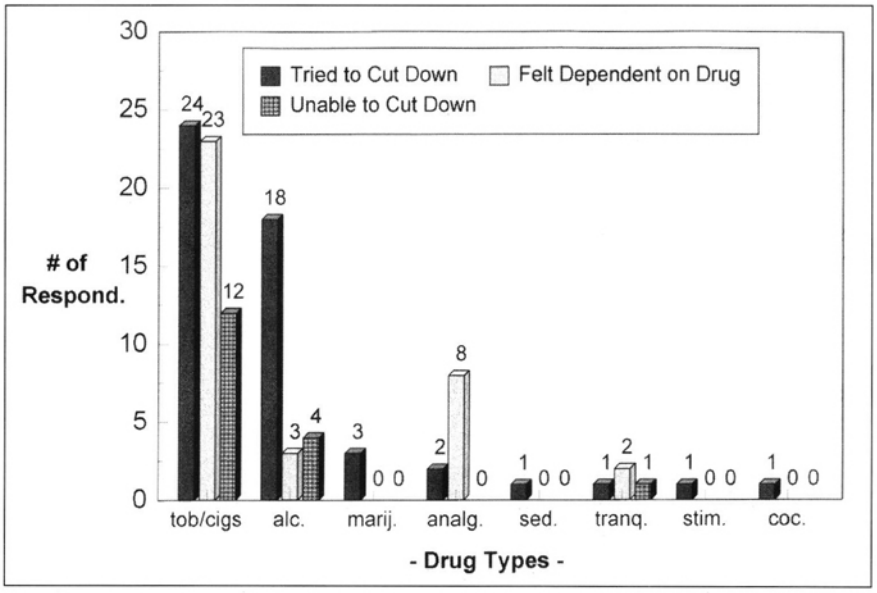

FIGURE 3. Behaviors over past 12 mo associated with abuse or dependence.

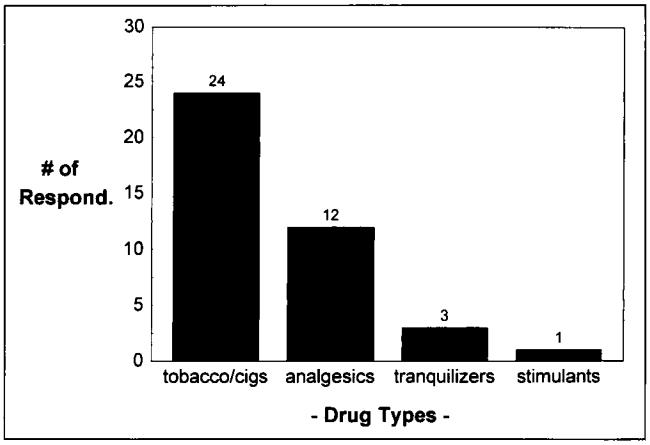

FIGURE 4. Specific drug types used at work over past 12 mo.

DISCUSSION

The data clearly show that the majority of this study population has used chemical substances in their lifetimes. Either one or two types of chemical substances have been used by the majority of respondents in their lifetimes, with the number of users generally dropping as the number of drug types used increases (Fig. 1). Alcohol, tobacco, analgesics and marijuana were the top drug types used by both lifetime users of a single drug type and lifetime users of multiple drug types. This is not surprising since alcohol and tobacco are legal, readily available and tend to be among the drugs of choice by first time drug users (*5*). Specifically, a positive correlation exists between smoking status and use of illicit drugs (*4*). It has also been found that of the illicit drugs, those with the highest opportunity for use are also the most commonly used (*5*). Marijuana

TABLE 5
Behaviors Exhibited by Respondents Over Past 12 Months as a Result of Using Drugs at Any Time in Their Life

Behavior exhibited	Number of respondents	Associated drug
Found it difficult to think clearly	6	Alcohol (3)
Felt irritable or upset	5	Alcohol (1); Tobacco/cigarette (2)
Had arguments/fights with family/friends	4	Alcohol (3)
Felt very nervous and anxious	2	Alcohol (1)
Got less work done than usual	2	Alcohol (1)
Nodded off/slept at work	2	Alcohol (1)
Became depressed or lost interest in things	1	Alcohol
Had health problems	1	No response
Felt suspicious or distrustful of people	1	Alcohol
Worked at significantly slower pace	1	Alcohol
Felt completely alone and isolated	0	–
Found it harder to handle problems	0	–
Had to get emergency help	0	–
Provided substandard patient care	0	–
Produced substandard quality images/work	0	–
Got written up or charged with unprofessional conduct	0	–

TABLE 6
Behaviors Exhibited by Respondents Over the Past 12 Months

Behavior exhibited	Number of respondents
Driven any kind of vehicle while under the influence of alcohol or drugs	30
Involved in a motor vehicle accident in which you were driving and in which you were at fault	3
Hit someone or got into a fight	2
Other than from a store, took money or property that did not belong to you	2
Received a violation for driving under the influence (DUI)	1
Sold drugs illegally	1
Used an MD's prescription pad or DEA number illegally to obtain prescription drugs	0
Hurt someone badly enough that they needed bandages or medical treatment	0
Took something from a store without paying for it	0

has been documented to have the highest opportunity for use among the illicit drugs (*5*). The study population follows this trend in that the chemical substance with the highest percentage lifetime use was alcohol (Table 2), followed in second place by tobacco (Table 2), and marijuana (Table 3) in fourth place. Analgesics or pain relievers were found to have the third highest percentage lifetime use (Table 3). This appears to be a reasonably legitimate ranking for several reasons. Analgesics are legal and, although they vary in ease of availability especially in comparing over the counter with prescription pain relievers, they are taken for a large scope of pain-related symptoms. Additionally, characteristics of the radiologic sciences professions, such as physical and mental stress and susceptibility to various illnesses that may induce pain symptoms, naturally raise the possibility of analgesic use. In comparing these top four drug types with national and regional groups, it was found that lifetime cigarette and smokeless tobacco use among the study group was markedly lower than for national or regional groups (Tables 2, 3). The study population's lifetime nonmedical analgesic use was significantly higher than that of either national or regional groups (Table 3), and their lifetime marijuana use was slightly lower than the national group, but almost the same as the southern region's use (Table 3).

In comparing the study population's lifetime nonmedical drug use for all remaining drug categories with national and regional use, a higher percentage lifetime use by the study population was found for cocaine, hallucinogens, heroin, stimulants, sedatives and tranquilizers (Table 3). The latter three drug categories exhibited markedly higher percentage lifetime use by the study population. A lower percentage lifetime use by the study population, as compared to national and regional groups, was found for marijuana/hashish, crack and inhalants, although none were markedly lower (Table 3). The marked differences pointed out for data in both Tables 2 and 3 appear statistically significant, but no formal statistical analysis could be performed because only percentage data were available for national and regional groups.

Results were reported above that compared drug use over the past 12 mo for the study population and national and regional groups for alcohol, marijuana and cocaine only. They showed that the study population's alcohol use was slightly lower than the national group, but somewhat higher than the regional group. The study population's use of marijuana and cocaine was somewhat lower than both national and regional groups.

Focusing on the study population's top four drug choices–alcohol, tobacco, analgesics and marijuana/hashish–data reveal that the majority of those who reported using alcohol at some time in their lives currently continue to use it. Overall, alcohol consumption showed occasional drinking patterns of moderate amounts, although one-third of drinkers exhibited a potential for heavier drinking, having consumed 5 or more drinks on the same occasion. Half of those who reported lifetime tobacco use continue to smoke, with the majority of them engaged in heavier smoking patterns (one half pack or more per day). Less than 5% of respondents reporting lifetime use of analgesics had used them nonmedically in the past year, whereas over 20% of those reporting lifetime use of marijuana/hashish confirmed nonmedical use over the past 12 mo (Fig. 2).

A global perspective of the study population's chemical substance use reveals that alcohol, tobacco, analgesics and marijuana have remained their drugs of choice. While study data indicate some use of other drug types in previous years, there is no evidence of a major trend to move from use of these four drug types on to nonmedical use of other over the counter drugs or to the less opportune illicit drugs. This is reinforced by the small number of respondents identifying nonmedical use in the past 12 mo of all the remaining drug categories surveyed (Fig. 2).

Study data also disclose that attempts have been made by respondents to cut down on chemical substance use (Fig. 3). In comparing these behaviors to actual nonmedical use (Fig. 2), it is interesting that for both analgesic and tranquilizer categories, more respondents reported feeling dependent upon these drugs than used them for nonmedical reasons. This implies that some respondents who are using analgesics or tranquilizers for medical reasons have begun to feel dependent upon them. These data also show that while alcohol is the number one drug of choice among the study population, it is not the focus in terms of curtailing use. Rather, more respondents are centering their attention on decreasing their tobacco use, and seem to be having the least success in this area compared to the other three top drug-types of choice. This is not to suggest that alcohol users encountered total success, but indicated less default. There may be several rationales to support the study population's emphasis on tobacco use reduction. First, social stigma associated with tobacco use has increased markedly in recent years. Second, it is easier to identify specific negative physical effects of tobacco than of the other top three drug types. Third, denial of abuse or dependency, particularly of those using alcohol, is historic and leads to the possibility that

while some respondents may need to cut down, they may be denying recognition of that need.

Finally, the study population lends credence to the generally held observation that chemical substance use influences behavior (Tables 4, 5). It is interesting that while respondents were rather open about some behaviors, as evidenced by the number of acknowledgments, there were few positive responses on items specifically relating to work or job. A natural question is whether this is indeed an accurate picture or whether the respondent's sensitivity to these questions was too high to yield an honest answer. This is further strengthened by the observation that there was no reported illicit drug use at work over the past 12 mo (Fig. 4).

CONCLUSION

This study provides formal documentation on prevalence, use patterns and some associated behaviors of eleven types of chemical substances among one segment of the radiologic sciences population. It is recognized that the data are most likely conservative due to the use of self-report as the means of data collection, and to a natural sensitivity of participants to this subject, but it is critical to keep in mind the focus of their interpretation. Under no circumstances is it to display radiologic science professionals in a negative light, but to recognize and accept that they are a slice of the American pie. It is general knowledge that chemical substance use, abuse and dependency does not discriminate along any lines, and these results show this study population is no exception. This study did show differences in use patterns of specific drug types between the study population and national and regional general population groups. It also documented some behaviors, and how the study population dealt with reducing chemical substance use on its own. Concrete conclusions regarding the work-related behavior questions were unable to be drawn. The study population's small size and lack of random sampling prevents it from being representative of the profession as a whole, leaving the results of this study unable to be generalized. Therefore, it is important that these data be used as an initial baseline to spur larger, more representative studies whose results can be used to develop ways to assist radiologic science professionals experiencing negative effects of chemical substances.

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