

## **Cigarettes & Psychotropic Medications: A study of the prescription pattern in an inpatient setting**

Sehba Husain-Krautter MD, PhD,<sup>1</sup> Connie Chang MD,<sup>1</sup> Thomas A. O'Hara MS,<sup>2</sup> Joseph Esposito MD,<sup>1</sup> Vallabh Suryadevara MD,<sup>1</sup> Dolly Mishra DO,<sup>1</sup> Kiran Luther MD,<sup>1</sup> Gerard Gallucci MD, MHS<sup>3</sup>

1. Delaware Psychiatric Center
2. Philadelphia College of Osteopathic Medicine
3. Office of the Secretary. Delaware Health and Social Services

### **Introduction**

Cigarette smoking is one of the most prevalent and preventable causes of illness and death worldwide. The CDC analyzed data from the 2014 Behavioral Risk Factor Surveillance System (BRFSS) to assess state-specific prevalence of cigarette use among the U.S. adult population showing that current cigarette smoking ranged from 9.7% (Utah) to 26.7% (West Virginia) with higher rates among males than females in all 50 states.<sup>1</sup>

An increased rate of cigarette smoking has been observed in patients with psychiatric illness compared to the general population.<sup>2,3</sup> Smoking rates among individuals with a mental illness or another addiction are two to three times higher compared to the rest of the population and tobacco-related illness is one of the highest-ranking causes of death in this population.<sup>4</sup> In a study comparing mortality rates across several states, it was shown that patients with major mental illness were more likely to die younger compared to the general population with smoking being one of the main contributing factors.<sup>5</sup> Smoking cessation in patients with psychiatric illness may have the greatest benefit in terms of morbidity and mortality in this population. Of the many suggested reasons for the high incidence of smoking among patients with mental illness include, anxiolytic effect, managing medication-related adverse effects, genetic vulnerability, and increased opportunities for socialization.<sup>2</sup>

Cigarette smoke contains thousands of discrete chemical compounds with at least 43 identified as being carcinogenic. Aside from the hazardous long-term health effects, cigarette smoke contains polycyclic aromatic hydrocarbons that can cause induction of hepatic cytochrome P450 (CYP) isozymes, therefore increasing metabolic clearance of drugs that are substrates for these enzymes.<sup>2</sup> The induction of CYP isozymes can alter the expected serum levels of several psychotropic medications metabolized specifically by CYP1A1, CYP1A2, and CYP2E1. This relationship between smoking and metabolism of psychotropic medications exposes patients with mental illness to increased smoking-related morbidity and mortality. Therefore part of managing patients with psychiatric illness who smoke requires dose adjustments of medications affected by smoking and also readjustment of those medications after smoking cessation.<sup>6</sup> The psychotropic drug classes mainly affected include selective serotonin reuptake inhibitors, tricyclic antidepressants, typical and atypical antipsychotics. Additionally since 1993, the US Joint Commission on Accreditation of Healthcare Organization (JCAHO) has mandated smoke-free hospitals in the US.<sup>7</sup> Though this regulation has changed the management of the inpatient population across all specialties, most patients who temporarily stop smoking in the hospital usually resume smoking soon after being discharged. The long-term smoking cessation rate after

hospitalization is estimated to be 15% in patients with mental illness compared with 30% in the general population.<sup>8</sup>

## Aim and Method

We were interested in assessing how many of our inpatient population at Delaware Psychiatric Center smoke cigarettes and what percentage of those smokers were prescribed psychotropic medications that could be affected by their smoking habit. As we were aware of the metabolism inducing effects of cigarettes we wanted to determine if changes to medications were made depending on the patients' smoking status. We were also interested in determining if there was a relationship between smoking and the length of hospitalization, the hypothesis being that smokers would stay for shorter periods in the hospital because they want to resume smoking (Table 1). Finally another significant piece of information we were interested in gathering was the diagnosis, in order to determine if the differences for prescribing certain psychotropics was possibly due to differences in diagnosis.

Table 1. Data derived from the patient charts plotted as a table to show distribution of age, gender, and average length of hospitalization.

	<b>Smokers (n=41)</b>	<b>Nonsmokers (n=53)</b>
Age (mean)	35	38
Male, n (%)	12.19	9.43
female, n (%)	87.81	90.57
Average length of hospitalization	15.9	27.8

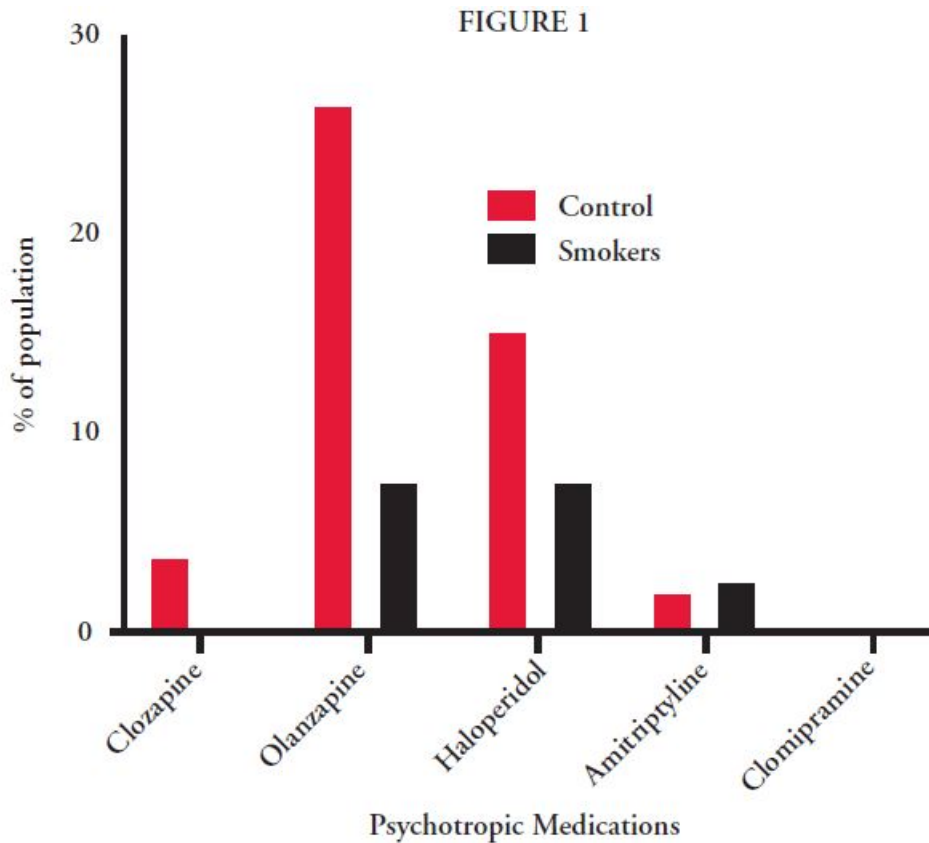
Out of the 444 inpatient admissions over the last year, we randomly selected 94 subjects and collected de-identified data from their charts. Fifty-three of the selected population were nonsmokers and 41 were smokers. We then selected the most common medications that we prescribe in our inpatient facility whose metabolism is affected by cigarette smoking and compared the prescription rate of these medications in smokers versus nonsmokers. The medications we focused on were clozapine, Olanzapine, Haloperidol, Amitriptyline, and Clomipramine.

## Results

### 1. Fewer percentage of cigarette smokers were prescribed psychotropic medications whose metabolism is affected by smoking.

Of the population that smoked cigarettes, only 14.63% were prescribed one or more medications that could be affected by smoking whereas among the control group 33.96% were prescribed medications that could be affected by smoking (Figure 1). This trend remained the same for all the psychotropic medications except Amitriptyline in our selected population.

Figure 1. Fewer percentages of cigarette smokers were prescribed psychotropic medications. Percentage of smokers and control groups using different psychotropic medications were calculated from total number of subjects and data is depicted as bar graphs.

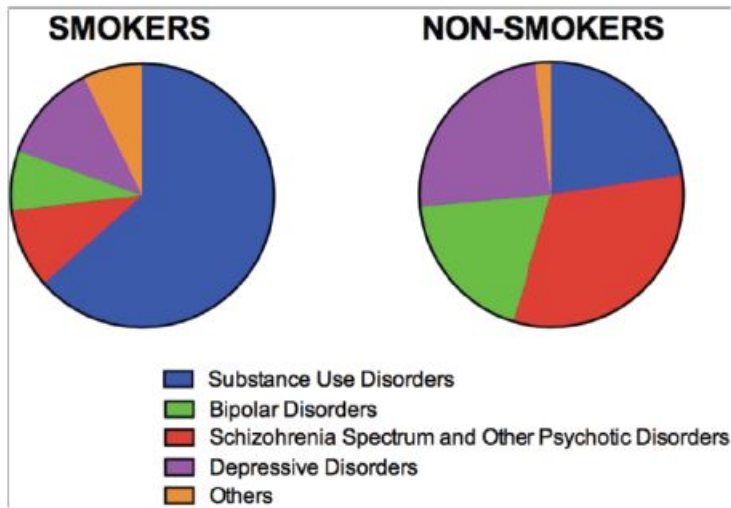


## 2. Larger percentage of cigarette smokers were using illicit substances when compared to control population.

63.41% of the patients who smoked cigarettes used other substances as compared to 22.64% in the control population (Figure 2). The main diagnosis in the control group was schizophrenia spectrum and other psychotic disorders at 32.1% with substance use disorders, bipolar disorders, depressive disorders, and others at 22.64%, 18.86%, 24.52%, and 1.88% respectively.

Figure 2. Larger percentage of cigarette smokers used other substances when compared to control population where greater percentage of the population was diagnosed with schizophrenia or other psychotic disorder. Depressive disorder was the 2nd most common diagnosis in the group that smoked as well as in the control group. Final diagnosis was calculated as a percentage of number of subjects in each group and data is depicted here as pie charts.

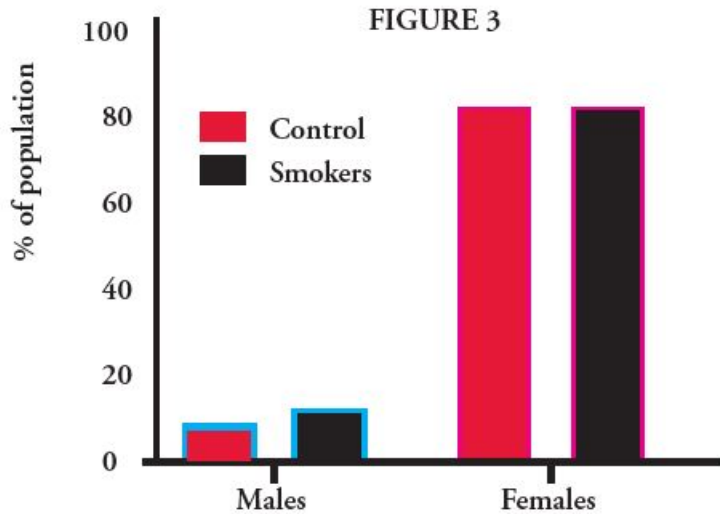
FIGURE 2



### 3. The selected population predominantly consisted of females in groups, smokers as well as non-smokers

Of the selected population, 87.81% of the patients were females in the group with a total number of 41 subjects who smoked, and 90.57% were females in the control group consisting of a total of 53 subjects who did not smoke (Figure 3). There was a very small increase in the male population in the group that smoked compared to controls at 12.19% versus 9.43% respectively.

Figure 3. Randomly selected population used for this study predominantly consisted of females. Percentage of female versus male was calculated from total subjects in both smokers as well as control group and data is represented as bar graphs.



## Discussion

This is the very first study of its kind exploring the choices psychiatrists make while prescribing psychotropic medications based on the patient's lifestyle choices, which could therefore modify the efficacy of the prescribed drug. Thus far our preliminary data suggests that among the selected population, patients that used cigarettes were less likely to be prescribed medications that were affected by smoking. Whether this was a conscious decision on part of the prescribing psychiatrist or if this decision was made based on the diagnosis as most of the population that smoked carried a diagnosis of substance use disorder is a question that needs to be further pursued. A definitive conclusion cannot be drawn from our small sample size and we need to expand this study to include all patients admitted to the inpatient facility at the Delaware Psychiatric center over a specific period of time to be able to provide answers to these queries.

Our data further indicates that people who smoke cigarettes have a higher propensity to be using other substances. Thus far, epidemiological data suggests that nicotine is a gateway to using other illicit substances and recent studies have supported this hypothesis. Additionally, it has been shown that adolescents who smoke cigarettes are highly sensitive to the rewarding effects of alcohol, cocaine and methamphetamine<sup>9</sup>. Nicotine tends to increase the extracellular dopamine levels enhancing the rewarding effects of stimulants, alleviates withdrawal from opioids, THC and alcohol, cognitive deficits from TCH and stimulates and enhances tolerances from opioids.<sup>9</sup> It has also been shown that the interactions with nicotine are also dependent on what age the patient was exposed to nicotine as an adolescent.<sup>10</sup> Further research taking into account the age of onset of nicotine use and its relationship with use of illicit substances could provide answers to these fundamental questions and also guide intervention strategies at an appropriate age. Once again due to our limited sample size we were not able to make any meaningful interpretation on the relationship between a specific illicit substance and cigarette smoking, however this is another area of interest we intend to pursue in the future.

Interestingly, our preliminary data also suggests that the selected population was predominantly female patients with mental illness. It is unclear if this was a selection bias or if there is a higher turnover in the female inpatient population, however this skew was seen in both smokers as well as nonsmokers. However, we do see a shorter length of hospitalization in the smokers versus

non-smokers at 15.9 days versus 27.8 days respectively (Table 1). It would be further interesting to analyze how many of the smokers left against medical advice so that they could resume smoking.

Though these results indicate that we are heading in the right direction by prescribing relatively less medications whose metabolism is affected by smoking in the group that smokes, further studies to investigate whether this population is being advised on the negative aspects of smoking and whether they are given the tools to quit smoking are also necessary. Additionally, as a follow-up it is important to know if the patient stops smoking so that psychotropic medications can be adjusted accordingly to prevent possible side-effects. Another important issue to investigate is if by withholding important psychotropic medications the population that smokes is more prone to relapse and further hospitalization.

In conclusion, when prescribing psychotropic medications providers should be careful to take the patient's smoking history into consideration and address tobacco use disorder in individuals with mental illness.

The same concerns should be addressed when assessing clinical response or the need for dose adjustments in smokers. It also gives rise to the question that should medications that are affected by smoking be substituted by alternatives or is dose adjustment a better way to proceed so as to not to deprive these patients of highly affective medications.

Importantly, we have to also keep in mind that in spite of the significant decrease in tobacco use in the general population that has occurred in the last 40 years, this trend has not been seen in patients with psychiatric illness.<sup>11</sup> While we are exploring the right psychotropic intervention, integrating education on tobacco dependence as well as introducing treatment modalities that are currently available to help quit smoking is extremely necessary. Also while prescribing to patients with mental illness, all medications should be reviewed with regards to any modifications required to suit the patient's lifestyle. Keeping these factors in mind while working with this patient population can facilitate medication compliance and help prevent further hospitalizations.

## References

1. Nguyen, K. H., Marshall, L., Brown, S., & Neff, L. (2016, October 7). State-specific prevalence of current cigarette smoking and smokeless tobacco use among adults - United States. *MMWR. Morbidity and Mortality Weekly Report*, 65(39), 1045–1051. [PubMed https://doi.org/10.15585/mmwr.mm6539a1](https://doi.org/10.15585/mmwr.mm6539a1)
2. Desai, H. D., Seabolt, J., & Jann, M. W. (2001). Smoking in patients receiving psychotropic medications: A pharmacokinetic perspective. *CNS Drugs*, 15(6), 469–494. [PubMed https://doi.org/10.2165/00023210-200115060-00005](https://doi.org/10.2165/00023210-200115060-00005)
3. Williams, J. M., Stroup, T. S., Brunette, M. F., & Raney, L. E. (2014, December 1). Tobacco use and mental illness: A wake-up call for psychiatrists. *Psychiatric Services (Washington, D.C.)*, 65(12), 1406–1408. [PubMed https://doi.org/10.1176/appi.ps.201400235](https://doi.org/10.1176/appi.ps.201400235)
4. Lawrence, D., Mitrou, F., & Zubrick, S. R. (2009, August 7). Smoking and mental illness: Results from population surveys in Australia and the United States. *BMC Public Health*, 9, 285. [PubMed https://doi.org/10.1186/1471-2458-9-285](https://doi.org/10.1186/1471-2458-9-285)

5. Colton, C. W., & Manderscheid, R. W. (2006, April). Congruencies in increased mortality rates, years of potential life lost, and causes of death among public mental health clients in eight states. *Preventing Chronic Disease*, 3(2), A42. [PubMed](#)
6. Aubin, H. J., Rollema, H., Svensson, T. H., & Winterer, G. (2012, January). Smoking, quitting, and psychiatric disease: A review. *Neuroscience and Biobehavioral Reviews*, 36(1), 271–284. [PubMed](#) <https://doi.org/10.1016/j.neubiorev.2011.06.007>
7. Longo, D. R., Feldman, M. M., Kruse, R. L., Brownson, R. C., Petroski, G. F., & Hewett, J. E. (1998, Spring). Implementing smoking bans in American hospitals: Results of a national survey. *Tobacco Control*, 7(1), 47–55. [PubMed](#) <https://doi.org/10.1136/tc.7.1.47>
8. Hughes, J. R., & Frances, R. J. (1995, May). How to help psychiatric patients stop smoking. *Psychiatric Services (Washington, D.C.)*, 46(5), 435–436. [PubMed](#) <https://doi.org/10.1176/ps.46.5.435>
9. Kohut, S. J. (2017, March). Interactions between nicotine and drugs of abuse: A review of preclinical findings. *The American Journal of Drug and Alcohol Abuse*, 43(2), 155–170. [PubMed](#) <https://doi.org/10.1080/00952990.2016.1209513>
10. Cross, S. J., Lotfipour, S., & Leslie, F. M. (2017, March). Mechanisms and genetic factors underlying co-use of nicotine and alcohol or other drugs of abuse. *The American Journal of Drug and Alcohol Abuse*, 43(2), 171–185. [PubMed](#) <https://doi.org/10.1080/00952990.2016.1209512>
11. Ziedonis, D., Williams, J. M., & Smelson, D. (2003, October). Serious mental illness and tobacco addiction: A model program to address this common but neglected issue. *The American Journal of the Medical Sciences*, 326(4), 223–230. [PubMed](#) <https://doi.org/10.1097/00000441-200310000-00014>

---

Copyright (c) 2016 Delaware Academy of Medicine / Delaware Public Health Association.

This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<https://creativecommons.org/licenses/by-nc-nd/4.0/>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.