Sustaining Screening of Key Health Risk Factors in New York State Mental Health Clinics After Implementation of the Health Indicator Initiative

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Objective: Screening data on obesity and smoking among adult outpatients in state-operated clinics were collected and analyzed by the New York State Office of Mental Health to determine relationships between demographic and clinical risk factors and obesity and smoking. Predictors of weight loss and smoking cessation were examined.

Methods: Individuals enrolled in 2010-2012 with two or more valid body mass index measures and two or more valid smoking measures (N=22,574) were selected. Chi square tests examined associations between demographic and clinical risk factors and obesity and smoking. Multivariable logistic regression identified predictors of weight loss and smoking cessation.

Results: The prevalence of obesity and smoking was 45% and 50%, respectively. The odds of losing weight or remaining at a stable weight were higher among males (versus females), individuals ages \leq 49 (versus \geq 50), smokers (versus

nonsmokers) at baseline, and individuals with diabetes (versus without diabetes). The odds of gaining weight were higher among individuals prescribed psychotropic medications compared with those who were not prescribed psychotropic medications. Individuals ages \leq 49 and those with a pulmonary condition or psychotic or substance use disorders (versus without these conditions) were less likely to quit smoking. Individuals who were obese (versus not obese) at baseline and those with an endocrine condition (versus without this condition) were more likely to quit smoking.

Conclusions: Significant associations were found between demographic and clinical risk factors and obesity, smoking, and improvements in smoking and obesity outcomes. Continued work is needed to identify critical points of intervention to prevent weight gain and promote weight loss and smoking cessation in this population.

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Smoking and obesity are the first and second leading causes of preventable deaths in the United States (1,2). Individuals with mental illness are more than twice as likely to smoke cigarettes and at least 50% more likely to be overweight or obese compared with individuals without a mental illness (3–5). The premature mortality observed among individuals with serious mental illness who receive public mental health services is predominantly due to treatable general medical conditions that are associated with modifiable risk factors, including obesity, cigarette smoking, substance use, and inadequate access to comprehensive medical care (6,7).

Evidence suggests that people with serious mental illness do not receive appropriate assessment, monitoring, and continuity of care for risk factors associated with treatable general medical conditions (8–13). In 2008, the National Association of State Mental Health Program Directors (NASMHPD) recommended using a standard set of indicators, including body mass index (BMI), blood pressure, and tobacco use, to monitor the health of individuals served in mental health settings.

In 2009, the New York State Office of Mental Health (NYS OMH) launched the New York Health Indicator Initiative with the goal of improving the overall health status of adult individuals in the state-operated system diagnosed as having mental illness. The initiative mandated that all 66 adult outpatient clinics operated by NYS OMH begin monitoring the BMI, blood pressure, and smoking status of all patients at three-month intervals. Initial findings indicated that nearly 50% of the 15,000 individuals served in adult outpatient clinics in 2009 were screened by the end of the year, the first year of implementation of the Health Indicator Initiative (14).

This study assessed the continued feasibility of the initiative and examined relationships among obesity, smoking, and comorbid risk or protective factors that contributed to the positive outcomes of losing weight and smoking cessation. We did not focus on blood pressure monitoring because of concerns about the validity of the readings at many sites that lacked high-quality equipment.

METHODS

Setting

The New York Health Indicator Initiative focused on providing smoking cessation and weight reduction interventions, which were introduced at variable time points in state-operated outpatient clinics. Clinicians had access to three Web-based training modules developed to support provider skills in the integration of tobacco cessation into behavioral health treatment for individuals with serious mental illness. Skills included tobacco assessment, counseling, and medication support. Further, several facilities became tobacco free campuswide to support efforts to improve tobacco cessation for recipients. Many OMH clinics offered groups to support wellness, weight loss, exercise, and tobacco cessation, and all had access to support in providing an organized curriculum for wellness self-management (15).

Study Design and Population

In this observational cohort study, individuals who were enrolled in the adult clinic outpatient program during 2010 to 2012 (N=29,258) were selected for further analysis. All health indicator measures related to BMI and smoking status for this population were selected for analysis. Individuals (N=22,574, 77%) with at least two smoking and two BMI measures were selected.

Data Source

All data were extracted from the NYS OMH electronic medical record known as the Mental Health Automated Record System (MHARS). The MHARS Metabolic Monitoring Tool was used to collect, review, and update individual cardiometabolic indicator data (height, weight, blood pressure, and smoking status). MHARS data utilized in this study also included individuals' demographic characteristics, psychotropic medications, and clinical information on primary mental health and comorbid general medical diagnoses.

Study Outcomes

Program implementation uptake was monitored with quarterly rates, beginning in quarter (Q) 1 of 2009 and going forward, of BMI and smoking status measures from the New York Health Indicator Initiative. The first available BMI and smoking status measures for each individual were designated as baseline. The last available BMI and smoking status measures were designated as follow-up. The mean \pm SD length of time between the baseline and follow-up measures was 883 \pm 485 days for BMI and 843 \pm 468 days for smoking.

BMI was calculated from weight and height measurements and categorized into the following groups: severely underweight (<16.0), underweight (16.0–18.4), normal (18.5–24.9), overweight (25.0–29.9), moderately obese (30.0–34.9), severely obese (35.0–39.9), and very severely obese (\geq 40.0). The categories were dichotomized as obese (BMI \geq 30.0) versus not obese (BMI <30.0) for bivariate analyses (16). For multivariable logistic regression models, stable or decreased BMI indicated stable weight or weight loss, and increased BMI indicated weight gain. Current smoking status was categorized as yes or no by asking, "Have you had a puff of a cigarette or more in the past month?" Smoking cessation was categorized as changing from currently smoking to not currently smoking during the clinic episode of care.

Demographic and Clinical Factors

Demographic and clinical characteristics were collected at admission. Age was categorized as 18-29, 30-49, 50-64, and \geq 65 and dichotomized as \leq 49 or \geq 50. Race was categorized as white, black, Asian/Hawaiian, multiracial, and other. Ethnicity was defined as either Hispanic or non-Hispanic. Primary mental health diagnosis at admission was categorized as anxiety disorder, bipolar disorder, psychotic disorder, and depressive disorder and was defined as yes or no. Secondary substance use disorder was defined as yes or no. Comorbid general medical conditions at admission were categorized as hyperlipidemia, diabetes, nonhepatic gastrointestinal disorders, endocrine conditions, pulmonary diseases, and joint and connective tissue diseases and were defined as yes or no. Psychotropic medication classes were categorized as antipsychotic, antidepressant, mood stabilizer, and antiseizure and were defined as ever used versus not used during the current clinic episode.

Statistical Analysis

BMI and smoking status were examined to determine change from baseline to follow-up. Separate chi square comparisons with unadjusted odds ratios were used to analyze associations between demographic and clinical risk factors of the study population and indicators of health risks (obesity and smoking status) at baseline. Multivariable logistic regression analysis was performed with stepwise variable selection to identify predictors of weight loss and smoking cessation. All tests for significance were set at p<.05. SAS, version 9.3, was used to perform all analyses (17). The NYS OMH Institutional Review Board deemed that this study was part of ongoing program management and quality improvement by the NYS OMH and did not require human subject review.

RESULTS

Program Implementation

From Q1 of 2009 to Q1 of 2013, the quarterly rate of monitoring in the NYS OMH clinics increased from 50% to 75% for BMI and from 26% to 76% for smoking. Since 2012, the rate of monitoring was stable at around 75% for all measures. The uptake of the Health Indicator Program was sustained TABLE 1. Obesity rates among 22,574 patients enrolled in adult outpatient clinics in 2010–2012, by demographic and clinical characteristics at admission^a

		Total		Obese (N=10,255, 45.4%)		Not obese (N=12,319, 54.6%)		χ^2		Odds of obesity	
Variable	N	%	N	%	N	%	df	р	OR	95% CI	
Gender Female Male (reference)	10,713 11,861	47.5 52.5	5,450 4,805	50.9 40.5	5,263 7,056	49.1 59.5	1	<.001	1.52	1.45–1.61	
Age group 18-29 30-49 50-64 ≥65	3,552 10,989 6,707 1,254	15.8 48.8 29.8 5.6	1,553 5,401 2,832 442	43.7 49.1 42.2 35.2	1,999 5,588 3,875 812	56.3 50.9 57.8 64.8	3	<.001			
Race White Black Asian/Hawaiian Multiracial Other	8,173 3,166 324 115 1,070	63.6 24.6 2.5 .9 8.3	3,626 1,515 65 54 480	44.4 47.9 20.1 47.0 44.9	4,547 1,651 259 61 590	55.6 52.1 79.9 53.0 55.1	4	<.001			
Hispanic ethnicity (reference: no) Psychotropic medication class (reference: no medication in specific class) Antipsychotic Antidepressant	1,397 15,881 10,981	6.2 74.7 51.7	673 7,264 5,358	48.2 45.7 48.8	724 8,617 5,623	51.8 54.3 51.2	1 1 1	.033 .137 <.001	1.12 1.05 1.32	1.01–1.25 .99–1.12 1.25–1.40	
Mood stabilizer Antiseizure	7,218 1,096	34.0 5.2	3,565 543	49.4 49.5	3,653 553	50.6 50.5	1 1	<.001 .005	1.27 1.19	1.20–1.35 1.05–1.34	
Current smoker (reference: nonsmoker) Primary psychiatric diagnosis (reference: no diagnosis in specific group)	11,371	50.4	4,898	43.1	6,473	56.9	1	<.001	.83	.78–.87	
Anxiety disorder Bipolar disorder Psychotic disorder Depression	1,403 3,211 11,916 4,669	6.4 14.6 54.3 21.3	603 1,579 5,255 2,205	43.0 49.2 44.1 47.2	800 1,632 6,661 2,464	57.0 50.8 55.9 52.8	1 1 1 1	.049 <.001 <.001 .008	.90 1.19 .88 1.09	.80-1.00 1.10-1.28 .8493 1.02-1.16	
Secondary substance use disorder (reference: none) General medical conditions (reference: none)	6,387	28.3	2,752	43.1	3,635	56.9	1	<.001	.88	.83–.93	
Hyperlipidemia Diabetes Pulmonary disease Joint and connective tissue disease Endocrine condition Nonhepatic Gl disease ^b	5,282 3,443 3,756 3,374 2,310 3,945	23.4 15.3 16.6 14.9 10.2 17.5	2,848 2,288 1,929 1,727 1,267 1.912	53.9 66.5 51.4 51.2 54.8 48.5	2,434 1,155 1,827 1,647 1,043 2,033	46.1 33.5 48.6 48.8 45.2 51.5	1 1 1 1 1 1	<.001 <.001 <.001 <.001 <.001 <.001	1.56 2.78 1.33 1.31 1.52 1.16	1.47-1.66 2.57-3.00 1.24-1.43 1.22-1.41 1.40-1.66 1.08-1.24	

^a Obesity and current smoking status were determined by the first available measurement between quarter 1 of 2009 and quarter 1 of 2013. ^b GI, gastrointestinal

by a dual process of development of health information technology (HIT) that facilitated reminders to update individual records and preparation of management reports that monitored rates of reporting of each indicator at each clinic. Clinic management staff reviewed the quarterly reports and set goals to improve monitoring.

Analysis of BMI and Smoking

Baseline BMI and smoking status. The overall rate of obesity was approximately 45%. Female gender, ages 30–49, African-American race, and Hispanic ethnicity were positively associated with obesity. Having (versus not having) a primary diagnosis of bipolar disorder or depressive disorder at admission and use of (versus no use of) antidepressant, mood stabilizer, or antiseizure medications were also positively associated with obesity. The prevalence of chronic general medical conditions and substance use disorders was high in this population. Having the chronic general medical conditions (versus not having) was positively associated with obesity. Smoking at baseline (versus not smoking) and having a primary diagnosis of psychotic disorder and a secondary diagnosis of substance use disorder (versus not having) at admission were negatively associated with obesity (Table 1).

The overall rate of smoking remained stable at 50% during the study period. Bivariate analyses revealed that smoking was positively associated with male gender and not being obese at baseline (BMI <30.0). Hispanics were less likely than non-Hispanics to be smokers versus nonsmokers. Race (p<.001) and age group (p<.001) were also significantly related to smoking status. Individuals with psychotic

TABLE 2. Smoking rates among	22,574 patients enrolled in	adult outpatient clinics in	1 2010-2012, by der	nographic and clinical
characteristics at admission ^a				

		Total		Smoking (N=11,371, 50.4%)		Not smoking (N=11,203, 49.6%)		χ ²	Odds of smoking	
Variable	N	%	Ν	%	Ν	%	df	р	OR	95% CI
Gender							1	<.001		
Female	10,713	47.5	4,628	43.2	6,085	56.8			.58	.55–.61
Male (reference)	11,861	52.5	6,743	56.9	5,118	43.1				
Age group							3	<.001		
18-29	3,552	15.8	1,801	50.7	1,751	49.3				
30–49	10,989	48.8	5,984	54.5	5,005	45.5				
50-64	6,707	29.8	3,205	47.8	3,502	52.2				
≥65	1,254	5.6	353	28.1	901	71.9				
Race							4	<.001		
White	8,173	63.6	4,163	50.9	4,010	49.1				
Black	3,166	24.6	1,766	55.8	1,400	44.2				
Asian/Hawaiian	324	2.5	81	25.0	243	75.0				
Multiracial	115	.9	49	42.6	66	57.4				
Other	1,070	8.3	447	41.8	623	58.2				
Hispanic ethnicity (reference: no)	1,397	6.2	541	38.7	856	61.3	1	<.001	.60	.54–.67
Psychotropic medication class (reference: no medication										
in specific class)										
Antipsychotic	15,881	74.7	8,463	53.3	7,418	46.7	1	<.001	1.41	1.33-1.50
Antidepressant	10,981	51.7	5,383	49.0	5,598	51.0	1	<.001	.84	.8089
Mood stabilizer	7,218	34.0	3,979	55.1	3,239	44.9	1	<.001	1.28	1.21-1.35
Antiseizure	1,096	5.2	573	52.3	523	47.7	1	.427	1.05	.93–1.19
Obesity (BMI \geq 30.0) (reference: <30.0)	10,255	45.4	4,898	47.8	5,357	52.2	1	<.001	.83	.7887
Primary psychiatric diagnosis (reference: no diagnosis										
in specific group)										
Anxiety disorder	1,403	6.4	681	48.5	722	51.5	1	.115	.92	.82–1.02
Bipolar disorder	3,211	14.6	1,624	50.6	1,587	49.4	1	.998	1.00	.93–1.08
Psychotic disorder	11,916	54.3	6,472	54.3	5,444	45.7	1	<.001	1.39	1.32–1.46
Depression	4,669	21.3	1,976	42.3	2,693	57.7	1	<.001	.66	.61–.70
Secondary substance use disorder (reference: no)	6,387	28.3	4,624	72.4	1,763	27.6	1	<.001	3.67	3.45-3.91
General medical condition (reference: no)										
Hyperlipidemia	5,282	23.4	2,649	50.2	2,633	49.8	1	.714	.99	.93–1.05
Diabetes	3,443	15.3	1,662	48.3	1,781	51.7	1	.007	.91	.84–.97
Pulmonary disease	3,756	16.6	2,315	61.6	1,441	38.4	1	<.001	1.73	1.61-1.86
Joint and connective tissue disease	3,374	14.9	1,713	50.8	1,661	49.2	1	.616	1.02	.95-1.10
Endocrine condition	2,310	10.2	1,001	43.3	1,309	56.7	1	<.001	.73	.67–.80
Nonhepatic GI disorder ^D	3,945	17.5	2,065	52.3	1,880	47.7	1	.006	1.10	1.03-1.18

^a Smoking status and obesity were determined by the first available measurement between quarter 1 of 2009 and quarter 1 of 2013.

^b GI, gastrointestinal

disorders or a secondary substance use disorder relative to individuals without such disorders and individuals prescribed antipsychotic or mood stabilizer medications relative to individuals not prescribed such medications were significantly more likely to be smokers than nonsmokers. Individuals with pulmonary disease or nonhepatic gastrointestinal disorders relative to individuals without such disorders were significantly more likely to be smokers than nonsmokers (Table 2).

Change in BMI and smoking status. Approximately 13% (N=1,648) of individuals who were not obese at baseline were obese at follow-up. Similarly, 14% (N=1,458) of individuals who were obese at baseline were not obese at follow-up. Approximately 21% (N=1,494) of overweight individuals became obese

during the study period, according to follow-up data. Within the obese population, moderately obese individuals (N=1,274, 25%) were more likely to drop below the obesity level (BMI <30.0) compared with severely obese (N=138, 5%) or very severely obese individuals (N=46, 2%). Approximately 15% (N=1,657) of individuals changed their smoking status from smoking to not smoking, and a similar percentage (15%, N=1,648) indicated that they started smoking.

Multivariable logistic regression was used to examine factors associated with change in BMI from baseline to follow-up. Male gender, age under 50, smoking at baseline, and a diagnosis of diabetes at admission were associated with maintaining a stable weight or with weight loss. Use of antipsychotic, antidepressant, or mood stabilizer medications during the episode was associated with weight gain (Table 3).

TABLE 3. Predictors of weight loss or stable weight among 22,574 patients enrolled in adult outpatient clinics in 2010–2012^a

Predictor	AOR ^b	95% Wald CI
Male (reference: female)	1.09	1.03-1.16
Age \leq 49 (reference: \geq 50)	1.24	1.16-1.32
Length of stay	1.00	1.00-1.00
Baseline smoker (reference: nonsmoker)	1.24	1.17-1.31
Antipsychotic use (reference: no)	.93	.87-1.00
Antidepressant use (reference: no)	.88	.8394
Mood stabilizer use (reference: no) Diabetes (reference: no)	.91 1.23	.85–.97 1.14–1.34

^a Results are from a multivariable logistic regression model examining predictors of weight loss or stable weight versus weight gain, as measured by body mass index. Predictors were assessed at admission, except current smoking status, which was determined by the first available measurement between quarter 1 of 2009 and quarter 1 of 2013. The final model included 20,711 patients (C statistic=.57).

^b Adjusted odds ratio

In multivariable logistic regression analyses, individuals who were obese at baseline or had an endocrine condition were more likely to quit smoking, and individuals who were under age 50 or had a psychotic disorder, a secondary substance use disorder, or pulmonary condition were less likely to quit smoking (Table 4).

DISCUSSION

This study demonstrates that it is possible to implement and sustain a statewide system to monitor important health risk factors among persons with mental illness. In addition, the success of this monitoring system is partially dependent on having an effective HIT system that can be used to monitor and track outcomes for individuals. The difficulty in accurate blood pressure monitoring has led to improvements in the equipment and training related to monitoring blood pressure in NYS OMH clinic settings.

The high rate of obesity in the population described in this study and disparities among racial and ethnic groups in the prevalence of health risk indicators are similar to those reported elsewhere (18). Overall, a small proportion of individuals who were obese dropped below the obesity level during the study period. However, this study underscores the importance of ongoing prevention of weight gain in the overweight population to prevent obesity. Similarly, efforts targeted toward sustaining weight loss in the segment of the population that dropped below the obesity threshold complement this strategy. Over the course of this study, evidence has mounted that comprehensive, multi-element psychosocial interventions can be effective in promoting weight loss among individuals diagnosed as having serious mental illness (19-21). It is clear that such interventions are necessary to help this population lose weight; monitoring alone in the absence of consistent interventions has not produced weight reduction.

TABLE 4. Predictors of quitting smoking among 11,371 patientsenrolled in adult outpatient clinics in 2010–2012^a

Predictor	AOR ^b	95% Wald CI
Age ≤49 (reference: ≥50)	.80	.7190
Length of stay	1.00	1.00-1.00
Baseline BMI ≥30.0 (reference: <30.0)	1.30	1.16-1.45
Psychotic disorder (reference: no)	.63	.5670
Secondary substance use disorder	.58	.5165
(reference: no)		
Pulmonary disease (reference: no)	.84	.74–.97
Endocrine condition (reference: no)	1.26	1.06-1.50

^a Results are from a multivariable logistic regression model examining predictors of quitting smoking versus continuing to smoke among patients who identified as current smokers at baseline (the first available measurement between quarter 1 of 2009 and quarter 1 of 2013). Predictors were assessed at admission, except BMI, which was assessed at baseline. The final model included 10,576 patients (C statistic=.62).

^b Adjusted odds ratio

In terms of smoking, the finding that approximately half of this study population smoked is consistent with other studies of smoking prevalence in chronically mentally ill populations (22). This rate is nearly three times the rate of smoking in the U.S. adult population (23). Further, a recent national study found that the quit rate for individuals with serious mental illness was lower than the quite rate for the general population (24). However, the finding that an equal percentage of individuals started and stopped smoking during the study period underscores that there is substantial fluidity in smoking. It also suggests the importance of focusing on relapse prevention among individuals who may quit for a period of time. The finding also suggests that the measure used to identify smokers may be a study limitation because it identified individuals who were not regular smokers.

Only 9% of individuals identified as smokers had a diagnosis of tobacco use in their separate MHARS clinic record. Given the high prevalence of smoking in the study population, having a diagnosis of tobacco use recorded in the clinic record could potentially help clinic providers to make preventive treatment plans for outpatients who smoke. Inconsistencies between the percentage of individuals identified as smokers and the corresponding percentage diagnosed as having a diagnosis of tobacco use are clear opportunities for improvement in the quality of services.

The study was limited in that other variables that are potentially associated with obesity and smoking among adults were not collected. These variables include client activity levels and dietary intake, the use of pharmaceuticals for smoking cessation, and the degree of participation in smoking cessation and weight reduction programs (25). In addition, smoking rates were based on self-report rather than biochemical tests, and we were not able to examine the relationship between treatments and outcomes. Furthermore, interventions focused on smoking cessation and weight reduction were introduced at variable time points in state-operated outpatient clinics, and it was not possible to record the availability of specific smoking cessation and weight reduction programs during the study period. Thus we were not able to examine the impact of the interventions on the outcomes. Finally, findings from this study may not generalize to individuals in non-state operated mental health clinics.

CONCLUSIONS

This study provides evidence of the feasibility of implementing and maintaining changes on a large scale in the monitoring of key health indicators by a public mental health system. To our knowledge, there are few studies that utilize large administrative data sets to research BMI and smoking in an adult population served in a state public mental health system. The findings of this study suggest that targeting weight loss and smoking cessation interventions to subgroups that are at high risk of health consequences due to obesity or smoking status may be a good strategy moving forward. Identifying individuals who are more likely to lose weight or quit smoking could help sustain positive momentum for those groups. Clearly, more systematic and intensive efforts around weight reduction and smoking for this population are needed.

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