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ORIGINAL PAPER

Smoking Reduction for Persons with Mental Illnesses: 6-Month Results from Community-Based Interventions

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Abstract Persons with mental illnesses use tobacco at significantly higher and heavier rates than the general population, and suffer greater tobacco- related morbidity and mortality. However, there are few existing tobacco cessation interventions for these individuals. This study examined two tobacco cessation interventions, a telephonic quitline intervention (counseling and nicotine replacement therapy) and a community-based group counseling intervention with adults currently receiving community mental health services. At 6-month follow-up, both groups demonstrated significantly reduced tobacco use, but participants who received both quitline services and the group counseling intervention were significantly more likely to have a 50% tobacco use reduction. Across groups, the overall intent-to-treat cessation rate was 7%. Tobacco dependence, depression symptoms, and psychotic symptoms decreased significantly for all treatment groups, while health and mental health functioning increased. Findings suggest that common community tobacco cessation services are effective for this population.

Keywords Mental health · Smoking cessation · Quitline · Behavioral counseling · Nicotine replacement therapy

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Introduction

Persons with mental illnesses are a priority population for tobacco cessation efforts (Bonnie et al. 2007; National Institutes of Health 2006). Tobacco use represents a significant risk factor affecting health, quality of life, and morbidity for persons with mental illnesses, with about 200,000 of the 443,000 premature deaths from smoking in the United States estimated to occur among persons with behavioral health disorders (Mauer 2006; Schroeder 2009). Although brief smoking cessation interventions are widely recommended in medical settings (Fiore et al. 2008), such interventions have rarely been implemented or studied in mental health settings. In fact, few mental health clinicians ask patients about smoking or advise them to quit (Himelhoch and Daumit 2003; Prochaska et al. 2004; Thorndike et al. 2001; Zvolensky et al. 2005). Moreover, there are limited referral options for cessation services, and those that do exist are not tailored to meet the intensity of services required by persons with mental illnesses (Tobacco Cessation Leadership Network 2008; Zvolensky et al. 2005).

Persons with mental illnesses and addictions disorders consume over 30% of cigarettes and comprise 44% of the entire US tobacco market (Grant et al. 2004; Lasser et al. 2000). The high prevalence of tobacco use among this population has been widely reported (e.g., Grant et al. 2004). Not only are these individuals more likely to smoke, they also smoke more cigarettes daily and smoke these cigarettes down to the filter (D'Mello et al. 2001; Lasser et al. 2000). Compared to the general US population smoking rate of 21%, persons with mental illnesses smoke at least at twice this rate (Centers for Disease Control and Prevention 2006; Lasser et al. 2000; Morris et al. 2006). Tobacco use prevalence varies according to psychiatric

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diagnoses and can be as high as 90% among persons with psychotic disorders (De Leon and Diaz 2005; Grant et al. 2004; Hughes et al. 1986; Lasser et al. 2000; Kalman et al. 2005; Morris et al. 2006; Ziedonis et al. 2008). These tobacco prevalence rates are the highest for those with multiple co-morbid psychiatric diagnoses (Lasser et al. 2000).

Persons with mental illnesses die up to 25 years earlier and suffer increased medical co-morbidity, compared to the general population (Brown et al. 2000; Colton and Manderscheid 2006; Dixon et al. 1999; Joukamaa et al. 2001; Mauer 2006; Osby et al. 2000). They are at greater risk of developing metabolic syndrome and cardiovascular diseases, as well as other tobacco related illnesses such as lung cancer and chronic obstructive pulmonary disease (BarChana et al. 2008; Brown et al. 2000; Dalack et al. 1998; Joukamaa et al. 2001). Psychiatric outcomes are also less favorable for persons with mental illnesses who are tobacco users: they experience more psychiatric symptoms, have more frequent hospitalizations, require higher dosages of medications, and achieve poorer treatment outcomes (Berk et al. 2008; Desai et al. 2001; Goff et al. 1992; Williams and Ziedonis 2004; Ziedonis et al. 1994).

The neurobiological, psychological, social, and societal variables associated with high tobacco use prevalence among persons with mental illnesses have been well documented (Desai et al. 2001; Forchuk et al. 2002; Freedman et al. 2001; Harris et al. 2004; Mauer 2006; Prochaska et al. 2007; Ziedonis et al. 2003). Although faced with multiple barriers to quitting tobacco, persons with mental illnesses are aware of the health consequences of their tobacco use, and express the desire to quit at a similar frequency to the general population of tobacco users (Addington et al. 1997; Prochaska et al. 2007; Siru et al. 2009). However, multiple barriers to effective tobacco cessation services exist, including insufficient funding and reimbursement, and the lack of knowledge and negative expectations of the ability to quit among both by patients and providers (Morris et al. 2009; Murali and Oyebode 2004).

In contrast to common patient and provider perspectives, there is growing evidence that tobacco cessation interventions are effective for persons with mental illnesses (Baker et al. 2006; Currie et al. 2008; Evins et al. 2004; Smith et al. 2007). This population responds to treatment modalities found effective in the general population, but due to very high levels of dependence, often requires a higher intensity of services consisting of a greater duration of treatment, frequency of counseling, and higher doses and/or combinations of cessation medications (Tobacco Cessation Leadership Network 2008; Ziedonis et al. 2008). The most effective cessation strategies are a combination of nicotine replacement therapy (NRT) or other cessation medications and individual or group counseling of four or more sessions (Fiore et al. 2008). Cessation counseling for persons with mental illnesses typically includes problem solving, skills training, cognitive-behavioral therapy and motivational interviewing strategies (e.g., Baker et al. 2006; Drake et al. 2001).

Quitlines are another primary tobacco cessation resource with demonstrated effectiveness (Anderson and Zhu 2007; Stead et al. 2007; Zhu et al. 2002). These telephonic services are widely available and generally offer some combination of counseling and cessation medications. Quitlines across the nation acknowledge that many of their callers have diagnosed or undiagnosed mental illnesses, with the prevalence of current mental illness among quitline callers being as high as 50% (McAfee et al. 2009; Tedeschi et al. 2009).

While aided quit rates for persons with mental illnesses are lower than for general populations, they are still substantial. Past studies have found individuals with history of major depression have quit rates as high as 38% (Lasser et al. 2000), while for schizophrenia quit rates may be between 10 and 30% (Addington et al. 1997; Baker et al. 2006). A study of community-based interventions for persons with non-acute psychotic disorders utilized a motivational interviewing-cognitive behavioral therapy intervention, and found the point prevalence rate of abstinence to be over 18% at 12 months for participants completing treatment sessions (Baker et al. 2006).

For those unable to immediately quit, reduction of use is an important goal that increases the probability of future cessation. Several reviews of studies for the general population find that a gradual approach to cessation which included counseling and cessation lead to later cessation (Fagerström 2005; Hughes and Carpenter 2006). Greater future cessation rates have also been found among smokers who switch from daily to non-daily use (McDermott et al. 2008). None of the studies reviewed found that reduction undermined later cessation. A Finnish study followed adult twins across a 15-year period to determine if reduction in tobacco use predicted later smoking cessation (Broms et al. 2008). The study concluded that individuals who reduced use by 25% over a 5-year period were more likely to quit 10 years later, a finding which is consistent with several similarly designed studies (Falba et al. 2004; Hughes et al. 1999).

Although there are no published studies yet, recent abstracts suggest quitlines are also effective for smokers with mental illnesses. Several quitline studies have found self-reported 7-day abstinence rates for persons with mental illnesses to be equivalent to general callers at the end of treatment and at 6 months (Hrywna et al. 2007; Kreinbring and Dale 2007; Tedeschi et al. 2009). Another recent study found that callers with self-reported depression, or endorsing a screening question asking if they felt

mental health issues would impact their quit attempt, predicted a difference in quit rates compared to the general population at 6 months (McAfee et al. 2009). Participants who endorsed both depression symptoms and the mental health impact question were 2.5 times less likely to be quit at 6 months.

Additional studies are needed to investigate treatment strategies, especially in actual clinical settings (Fiore et al. 2008; Flay et al. 2005; Ziedonis et al. 2008). Quitlines are readily available, but mental health providers seldom make referrals to these services. Nor have they integrated smoking cessation into existing community-based mental health care. At the same time, mental health agencies are logical settings to address tobacco cessation; mental health providers treat patients over long periods of time, have therapeutic alliances that might facilitate regular tobacco use assessment, commonly work within a wellness and recovery model, and are able to regularly provide treatment and monitor for symptom exacerbation (Hall et al. 2006; McFall et al. 2005).

This pilot study investigated the effectiveness of community-based tobacco cessation interventions for persons with mental illnesses. The study's primary hypotheses were that: (1) quitline services (i.e., telephonic counseling and NRT) will significantly reduce daily cigarette consumption compared to treatment as usual, and (2) quitline services plus a community-based tobacco cessation group intervention will result in significantly greater reduction of cigarette consumption compared to quitline services alone. Secondary exploratory hypotheses were that interventions decrease nicotine dependence and increase self-efficacy, and that smoking cessation attempts will not exacerbate psychiatric or physical health symptoms.

Methods

Design

This pilot study was conducted at four community mental health clinics in both rural and urban areas. Quitline services were provided by National Jewish Health, one of the largest quitline agencies in the U.S. Participants were individually randomized at each site to one of two intervention groups: quitline services alone (n = 61) or quitline services plus a community tobacco cessation group of up to 10 sessions (n = 62).

Sample

Participants with psychiatric diagnoses were recruited from local community mental health centers and continued to receive treatment as usual from their clinicians during the course of the study. Almost all participants were Medicaid and/or Medicare beneficiaries. The inclusion criteria were being a regular smoker (≥5 cigarettes per day), age 18 or older, able to provide informed consent and participate in groups, and English-speaking. Participants were included if they expressed an interest in quitting regardless of their motivational readiness to quit. Given the naturalistic design of the study, exclusion criteria were minimal and included current severe psychiatric symptoms (including suicidal ideation) and current clinically significant substance abuse.

Procedure

Community mental health center clinicians were trained by the research team to conduct tobacco cessation groups tailored to psychiatric patients (e.g., the impact of smoking on psychiatric medications, potential cognitive difficulties, and genetic predispositions). Prescribers (physicians and advanced practice nurses) received training on tobacco cessation best practices and pharmacotherapy for persons with mental illnesses; community providers then identified interested patients from their practices. Study participants continued their usual psychiatric treatment. Mental health center clinicians were instructed to monitor for exacerbation of psychiatric symptoms and emergence of depression, and adjust psychiatric medication doses as needed.

Quitline Intervention

Quitline services were provided by National Jewish Health. Five existing quitline counselors were assigned to work with the study cohort after completing training by the investigators on psychiatric illnesses and symptoms, special considerations when initiating tobacco cessation with this population, and emergency/crisis procedures. The research team provided ongoing consultation to ensure that quitline counseling and community interventions were aligned (e.g., messaging to participants). Quitline services were initiated through fax referral from participating sites. Quitline services consisted of up to 5 proactive calls to assist with quit attempts, promote healthier lifestyles, and prevent relapses. The quitline provided up to 12 weeks of free NRT patches to all interested participants. NRT dosing schedule was 21 mg weeks 1-6, 14 mg weeks 7–8, and 7 mg weeks 9–12.

Group Tobacco Cessation Intervention

The tobacco cessation group treatment was based on the "Smoking Cessation for Persons with Schizophrenia" group intervention designed by SANE, an Australian advocacy and treatment organization (Baker et al. 2004). Previous study has demonstrated the effectiveness of the

SANE intervention for persons with psychotic disorders (Baker et al. 2006). The group program was based on a comprehensive treatment manual and includes education on smoking and cessation, positive reinforcement, learning and practicing alternative behaviors, enhancing coping skills, supportive relationships and anxiety reduction strategies. Group sessions were conducted by two facilitators, who were mental health clinicians with group therapy experience and who had completed a 4 hour training on the treatment model. The group intervention consisted of up to 10 sessions.

Outcome Measures

Outcome measures were administered at baseline and 6-months. The primary outcome measure was self-reported smoking (average cigarettes per day in the last 7 days). We assessed 50% reduction in self-reported smoking compared to baseline, an outcome increasingly utilized in tobacco treatment studies (Tønnesen 2002). Tobacco cessation was verified by breath carbon monoxide (CO) using a CO Sleuth carbon monoxide breath test from Breathe E-Z systems Inc, with cessation validated as CO levels of less than 6 ppm.

Nicotine dependence was measured by the Fagerström Test for Nicotine Dependence (FTND). The FTND measures smoking behaviors indicative of physical dependence and is frequently used in smoking treatment research (Heatherton et al. 1991). Depression symptoms and general psychiatric symptoms were assessed by the Hamilton Depression Scale (Hamilton 1960) and Brief Psychiatric Ratings Scale (Overall and Gorham 1962). Quality of Life was assessed via the Short Form 12 (SF-12) Health Survey Standard Version (Ware et al. 1996). The SF-12 provides both physical and mental health functioning scores. We also administered self-efficacy items from the Snyder Hope Scale (Snyder et al. 1996).

Data Analyses

Descriptive statistics were used to characterize the study population at baseline. We addressed consumer acceptance of the tobacco cessation intervention- (consumer attendance at sessions, drop-out). Chi-squares and *t*-tests were used to determine whether there were differences between 1) patients randomized to different treatment conditions and 2) dropouts and non-dropouts. Patient level clinical and sociodemographic covariates (e.g. age, gender, diagnosis) were included in multivariate analysis if treatment groups differed on covariates at $P < .15$, if covariates were significantly associated with outcome or dropout at $P < .15$ in bivariate analysis, or if considered clinically necessary to include in analyses.

Chi square tests were used to test the association between 50% reduction in smoking and treatment group. Multiple logistic regression analysis was used to model 50% reduction as a function of treatment group and baseline sociodemographic and clinical covariates as described above. Intent-to-treat analyses were used, assuming that participants lost to follow-up did not achieve 50% reduction.

We also analyzed self-reported smoking (number of cigarettes per day) at baseline and 6 months as a continuous variable. General linear mixed models were used to analyze repeated measures within individuals and test the hypothesis that there was a greater reduction in smoking among individuals randomized to the quitline plus group cessation intervention than for individuals randomized to quitline only. This analysis included all available data but no imputation was done, so that individuals who had baseline smoking information but not 6-month data contributed only 1 observation.

This study was approved by the Colorado Multiple Institutional Review Board. The authors have no conflicts of interest. All authors certify their responsibility for this study and manuscript.

Results

Demographics and psychiatric diagnoses were captured from medical records as summarized in Table 1. Treatment groups did not differ significantly on baseline sociodemographic or clinical characteristics (all $P < .05$). The mean

Table 1 Participant demographics

Demographic characteristic	Quitline only N = 61 (%)	Quitline plus community group N = 62 (%)
Gender		
Female	59	58
Race/ethnicity		
Asian	2	2
Black	8	8
Latino/a or Latin American or Hispanic	13	3
Native American or indigenous	3	2
Pacific Islander	0	0
White	77	85
Other	0	2
Primary psychiatric diagnosis		
Schizophrenia	23	31
Bipolar	36	27
Depression	21	16
Other (e.g., anxiety)	36	34

age of participants was 43, with a range of 20–69. Of the 123 patients enrolled in the study, 87 actually received at least one quitline or community group session. Of these, 83 reported 6-month data on smoking and clinical status. Patients who dropped out prior to 6-months did not differ significantly from patients who remained active on sociodemographic variables or baseline smoking. Patient dropout was significantly associated with primary psychiatric diagnosis. Among those dropping out the diagnoses were: schizophrenia—17%, bipolar disorder—36%, depression—52%, and other diagnosis—29% (all $P < .05$).

Smoking reduction of 50% or greater (i.e., including those who were abstinent) was achieved by 18 patients at 6 months. Intent-to-treat analysis of 50% reduction by treatment group revealed a trend toward an association between treatment condition and achieving 50% reduction (8% for quitline only, 21% for the quitline plus cessation group arm) ($\chi^2_{(1df)} = 4.01$, $P = .0451$). Using intent-to-treat analysis, eight participants (7%) had maintained cessation at 6 months. Of those reporting data at 6-months, 10% were abstinent. For the logistic regression analysis, educational level was included as a covariate. Patients who were in the quitline plus group cessation intervention were more likely to achieve 50% reduction in smoking than patients in the quitline only group, after adjusting for education ($\chi^2_{(1df)} = 4.09$, $P = .0431$, adj OR = 3.16 (95% CI 1.04, 9.65).

Table 2 presents preliminary results from repeated measures analyses using SAS 9.1 Proc Mixed compared baseline to 6-month data on all available data (without imputation) across groups. There was a significant decrease in self-reported average number of cigarettes smoked per day across both groups, ($F(1,79) = 16.99$, $P > .0001$).

For demographic variables, it was observed that men in the study smoked more cigarettes per day than women ($F(1,163) = 6.41$, $P > .01$). However, the gender by time interaction effect was not significant. Scores on the HAM-D and BPRS showed a significant decrease in depression and psychotic symptoms, respectively over time for all groups ($P < .01$), but did not differ between groups. The SF-12 measures also showed significant improvement on physical health and mental health domains across both treatment groups ($P < .0001$), but on the physical health domain there was significantly better improvement for the quitline plus group intervention ($P = .0397$). All groups had significantly lower rates of tobacco dependence from baseline as measured by the FTND ($P < .01$), but there was not a difference between groups. There was no significant improvement for the self-efficacy measure.

Due to the small N of the study, we also completed a posthoc power calculation to determine the likelihood that we would have the ability to find a difference if it existed. For continuous outcomes, we had 81% power to detect a .52 SD difference between the two groups.

Discussion

This paper reports on one of the few randomized studies of community-based smoking cessation interventions for persons with mental illnesses. Participants represented a naturalistic clinical population of adult clients treated in

Table 2 Pilot cessation study 6-month outcomes

Estimates from repeated measures model	Quitline only		Quitline plus community group	
	Baseline Mean (SE)	6 Months Mean (SE)	Baseline Mean (SE)	6 Months Mean (SE)
Primary outcomes				
Smoking (cigarettes per day)**	19.80 (1.17)	14.89 (1.45)	21.04 (1.17)	16.11 (1.40)
Secondary outcomes				
HAMD**	12.93 (.81)	10.36 (.99)	13.41 (.80)	10.12 (.94)
BPRS**	45.82 (1.57)	40.04 (1.86)	45.25 (1.55)	38.80 (1.77)
SF12 physical health^{++}	40.25 (1.74)	42.32 (1.92)	40.02 (1.72)	46.25 (1.85)
SF12 mental health*	37.97 (1.65)	43.26 (1.98)	39.22 (1.63)	40.17 (1.88)
FTND**	5.72 (.32)	4.09 (.38)	6.12 (.32)	4.74 (.36)
Snyder hope scale	33.72 (1.18)	33.50 (1.40)	32.30 (1.15)	33.36 (1.32)

For the Hamilton Depression Scale (HAMD) and Brief Psychiatric Rating Scale (BPRS) higher scores are interpreted as worse functioning. For the short form 12 health survey (SF-12) higher scores are interpreted as better functioning. Higher scores on the Fagerström Test for Nicotine Dependence (FTND) are interpreted as greater nicotine dependence. Higher scores on the Snyder Hope Scale (self-efficacy) are interpreted as increased hope and self-efficacy

* $P < .0001$ for change over time; however, *differences* in change over time across groups were not significant

** $P < .01$ for change over time; however, *differences* in change over time across groups were not significant

$^{++}$ Both got higher ($P < .0001$) with additional improvement in the quitline plus community group ($P = .0397$)

community mental health settings. The study was designed to look at the effectiveness of two potential cessation interventions which are infrequently offered to persons with mental illnesses: tobacco cessation services provided by community mental health centers and telephonic quitline services consisting of counseling and nicotine replacement therapy (NRT). By design, the interventions utilized were relatively easy to implement, were inclusive of all diagnostic groups, and made use of existing resources (e.g., existing clinical staff) in the hopes of identifying a model that was sustainable for public mental health systems.

The primary outcome for this study was 50% reduction in smoking from baseline to 6 months (yes/no). Fifteen percent of participants reduced their tobacco use by half or more. The 6-month intent-to-treat smoking cessation rate was 7%. While cessation is the ultimate goal of tobacco treatment, many participants failed to quit altogether but were motivated to significantly reduce their use, and there was a significant reduction in self-reported number of cigarettes smoked for both groups.

Those randomized to both quitline services and cessation groups were significantly more likely to reduce tobacco use by 50% compared to the quitline only group. These findings suggest that multiple service modalities lead to enhanced outcomes. This supports the general consensus that very nicotine dependent groups require more intensive and more frequent treatment, potentially across multiple treatment modalities (Fiore et al. 2008). Further dose–response analyses might clarify if increased number of quitline and/or cessation group sessions is associated with better outcomes. It may be that initially NRT or other pharmacotherapy drives effectiveness, but that increased social support and coping skills development are critical to long-term abstinence, particularly as NRT and/or other pharmacotherapy are discontinued.

Quitline services have been shown to be a cost-effective means of extended service reach to racial and ethnic groups when the literacy and cognitive levels of services are appropriate to the population served (Anderson and Zhu 2007). Similarly, study findings suggest that persons with mental illnesses do respond to quitline services, but more work is needed to determine if and how quitlines might adjust standard treatment protocols to best respond to this population. Expert opinion does suggest that quitline staff might work more effectively with persons with mental illnesses after receiving training from mental health specialists (Morris et al. 2009). Also, recent research suggests that quitline effectiveness may vary according to callers' expectation of how their psychiatric symptoms possibly interfere with their quit attempt, rather than psychiatric diagnosis per se (McAfee et al. 2009).

It is a commonly held belief that smoking reduction and cessation exacerbate psychiatric symptoms. Past studies have found cessation to exacerbate symptoms of schizophrenia (Dalack and Meador-Woodruff 1996) or depression in people with a history of affective disorders (Glassman et al. 2001; Killen et al. 2003). Contrary to these past findings, this study found that, not only was there no worsening of psychiatric symptoms, but participants reported a significant reduction in depression and psychotic symptoms. We further found that health improved across both groups, and significantly more among those receiving both quitline and group interventions. This supports other studies which have found that either smoking cessation has no negative impact on psychiatric symptoms or participation in smoking cessation efforts are even associated with better mental health and overall functioning (Baker et al. 2006; Lawn and Pols 2005; Prochaska et al. 2008). It must be noted that self-efficacy did not change over time, but a recent meta-analysis found that the association between smoking cessation and self-efficacy was limited (Gwaltney et al. 2009).

The study design was purposeful in its inclusion of a cross-section of psychiatric diagnoses. Given limited resources inherent to public systems of care and typical practice, we expected that community mental health settings would not typically be in the financial position to offer diagnosis-specific cessation services. Even so, patient dropout was found to be significantly associated with primary psychiatric diagnosis, with the highest rate of drop-out rates being for depression. The reasons for these varying drop-rates are unclear and additional research might determine if interventions tailored to specific diagnoses such as depression better attract individuals to treatment and enhance adherence and treatment completion.

There are several limitations of the current study. A larger sample size would have allowed for increased sensitivity to differences between groups. There was no control group in this study. All participants were randomized to receive at least quitline counseling and NRT, which is a substantial intervention in itself. We did not assess for number of previous quit attempts, but qualitative findings from similar settings suggest that these individuals are afforded less opportunity to quit and have less past attempts in comparison to the general population (Morris et al. 2009). Also, participants receiving NRT may have not been receiving sufficient medication dosages or combination pharmacotherapy. Staff and provider training was another prominent issue. Quitline staff did not necessarily possess a mental health treatment background and the participating community mental health clinicians had never provided tobacco cessation services. Although training was provided to both quitline and mental health center staff, this training may have been insufficient.

We observed lower cessation rates than found by previous study of persons with mental illnesses (Baker et al. 2006; Currie et al. 2008). This was most likely because the

study was underpowered to do so. But it is also noteworthy that 29% of participants did not use any quitline or community cessation services. This may have been largely due to enrollment of participants regardless of motivational stage of change. While all those consenting to the study stated an interest in quitting, some participants were in early stages of readiness and possibly unprepared to quit. For this population, a longer preparation time may be needed to build external resources and coping skills before long-term abstinence is realistic. In the future, treatment enrollment and adherence might be increased by first building individual motivation for behavioral change as a criterion for cessation services. Clinicians might also decrease treatment drop-out by assisting individuals with common barriers to treatment such as adequate transportation and regular access to a telephone.

It will be important for future studies to use a control group to determine to what extent findings are due to a selection bias. Future research might determine what dose of counseling and NRT and/or other medications are needed to effectively drive reduction and cessation for this population. More study is also warranted regarding best means of training quitline staff and community clinicians to work with persons with psychiatric conditions.

Even with these limitations, findings support that persons with mental illnesses can reduce tobacco use through both quitline and community group interventions, and that tobacco reduction may often occur prior to cessation (Hughes and Carpenter 2006). All the interventions were effective in reducing tobacco use and decreasing nicotine dependence. There were no worsening of psychiatric symptoms and patients decreased nicotine dependence and reported improvements in overall mental health and functioning.

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References

Addington, J., el-Guebaly, N., Addington, D., & Hodgins, D. (1997). Readiness to stop smoking in schizophrenia. *Canadian Journal of Psychiatry, 42*(1), 49–52.

Anderson, C. M., & Zhu, S. H. (2007). Tobacco quitlines: Looking back and looking ahead. *Tobacco Control*, *16* Suppl 1, i81–86.

Baker, A., Kay-Lambkin, F., Bucci, S., Haile, M., Richmond, R., & Carr V. (2004). Intervention for tobacco dependence among people with mental illness. *National Drug and Alcohol Research Centre Technical Report No. 192*. Centre for mental health studies, Faculty of health, University of Newcastle, Australia. Retrieved February 2006, from http://ndarc.med.unsw.edu.au/NDARCWeb.nsf/resources/TR_4/$file/TR.192.pdf.

Baker, A., Richmond, R., Haile, M., Lewin, T., Carr, V., Taylor, R., et al. (2006). A randomized controlled trial of a smoking cessation intervention among people with a psychotic disorder. *American Journal of Psychiatry, 163*(11), 1934–1942.

BarChana, M., Levav, I., Lipshitz, I., Pugachova, I., Kohn, R., Weizman, A., et al. (2008). Enhance cancer risk among patients with bipolar disorder. *Journal of Affective Disorders, 108*(1–2), 43–48.

Berk, M., Nq, F., Wang, W. V., Tohen, M., Lubman, D. I., Vieta, E., et al. (2008). Going up in smoke: Tobacco smoking is associated with worse treatment outcomes in mania. *Journal of Affective Disorders, 110*(1–2), 126–134.

Bonnie, R. J., Stratton, K., & Wallace, R. B. (Eds.) (2007). *Ending the tobacco problem: A blueprint for the nation*. National Academies Press. Retrieved from http://www.nap.edu/catalog/11795.htm.

Broms, U., Korhonen, T., & Kaprio, J. (2008). Smoking reduction predicts cessation: Longitudinal evidence from the Finnish adult twin cohort. *Nicotine & Tobacco Research, 10*(3), 423–427.

Brown, S., Inskip, H., & Barraclough, B. (2000). Causes of the excess mortality of schizophrenia. *British Journal of Psychiatry, 177*, 212–217.

Centers for Disease Control and Prevention. (2006). Cigarette smoking among adults—United States. *Morbidity and Mortality Weekly Report, 56*, 1157–1161.

Colton, C. W., & Manderscheid, R. W. (2006). 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.

Currie, S. R., Karltyn, J., Lussier, D., de Denus, E., Brown, D., & El-Guebaly, N. (2008). Outcome from a community-based smoking cessation program for persons with mental illnesses. *Community Mental Health Journal, 44*(3), 187–194.

D'Mello, D. A., Bandlamudi, G. R., & Colenda, C. C. (2001). Nicotine replacement methods on a psychiatric unit. *American Journal of Drug and Alcohol Abuse, 27*, 525–529.

Dalack, G. W., Healy, D. J., & Meador-Woodruff, J. H. (1998). Nicotine dependence in schizophrenia: Clinical phenomena and laboratory findings. *American Journal of Psychiatry, 155*(11), 1490–1501.

Dalack, G. W., & Meador-Woodruff, J. H. (1996). Smoking, smoking withdrawal, and schizophrenia: Case reports and a review of the literature. *Schizophrenia Research, 22*(2), 133–141.

De Leon, J., & Diaz, F. J. (2005). A meta-analysis of worldwide studies demonstrates an association between schizophrenia and tobacco smoking behaviors. *Schizophrenia Research, 76*, 135–137.

Desai, H. D., Seabolt, J., & Jann, M. W. (2001). Smoking in patients receiving psychotropic medications: A pharmacokinetic perspective. *CNS Drugs, 15*(6), 469–494.

Dixon, L., Postrado, L., Delahanty, J., Fischer, P. J., & Lehman, A. (1999). The association of medical comorbidity in schizophrenia with poor physical and mental health. *Journal of Nervous and Mental Disease, 187*(8), 496–502.

Drake, R. E., Essock, S. M., Shaner, A., Carey, K. B., Minkoff, K., Kola, L., et al. (2001). Implementing dual diagnosis services for clients with severe mental illness. *Psychiatric Services, 52*, 469–476.

Evins, A. E., Cather, C., Rigotti, N. A., Freudenrich, O., Hendesen, D. C., Olm-Shipman, C. M., et al. (2004). Two-year follow-up of a smoking cessation trial in patients with schizophrenia: increased rates of smoking cessation and reduction. *Journal of Clinical Psychiatry, 65*(3), 307–311.

Fagerström, K. O. (2005). Can reduced smoking be a way for smokers not interested in quitting to actually quit? *Respiration, 72*, 216–220.

Falba, T., Jofre-Bonet, M., Busch, S., Duchovny, N., & Sindelar, J. (2004). Reduction of quantity smoked predicts future cessation among older smokers. *Addiction, 99*(1), 93–102.

Fiore, M. C., Jaén, C. R., Baker, T. B., Bailey, W. C., Benowitz, N., Curry, S. J., et al. (2008). *Treating tobacco use and dependency: 2008 update practice guideline*. Rockville, MD: US Department of Health and Human Services. Public Health Service.

Flay, B. R., Biglan, A., Boruch, R. F., Castro, F. G., Gottfredson, D., Kellam, S., et al. (2005). Standards of evidence: Criteria for efficacy, effectiveness and dissemination. *Prevention Science, 6*(3), 151–175.

Forchuk, C., Norman, R., Malla, A., Martin, M. L., McLean, T., Cheng, S., et al. (2002). Schizophrenia and the motivation for smoking. *Perspectives of Psychiatric Care, 38*(2), 41–49.

Freedman, R., Leonard, S., Gault, J. M., Hopkins, J., Cloninger, C. R., Kaufmann, C. A., et al. (2001). Linkage disequilibrium for schizophrenia at the chromosome 15q13–14 locus of the alpha7-nicotinic acetylcholine receptor subunit gene (CHRNA7). *American Journal of Medical Genetics, 105*(1), 20–22.

Glassman, A. H., Covey, L. S., Stetner, F., & Rivelli, S. (2001). Smoking cessation and the course of major depression: A follow-up study. *Lancet, 357*, 1929–1932.

Goff, D. C., Henderson, D. C., & Amico, E. (1992). Cigarette smoking in schizophrenia: relationship to psychopathology and medication side effects. *American Journal of Psychiatry, 149*(9), 1189–1194.

Grant, B. F., Hasin, D. S., Chou, S. P., Stinson, F. S., & Dawson, D. A. (2004). Nicotine dependence and psychiatric disorders in the United States: Results from the national epidemiologic survey on alcohol and related conditions. *Archives of General Psychiatry, 61*, 1107–1115.

Gwaltney, C. J., Metrik, J., Kahler, C. W., & Shiffman, S. (2009). Self-efficacy of smoking cessation: A meta-analysis. *Psychology of Addictive Behaviors, 23*(1), 56–66.

Hall, S. M., Tsoh, J. Y., Prochaska, J. J., Eisendrath, S., Rossi, J. S., Redding, C. A., et al. (2006). Treatment for cigarette smoking among depressed mental health outpatients: A randomized clinical trial. *American Journal of Public Health, 96*, 1808–1814.

Hamilton, M. (1960). A rating scale for depression. *Journal of Neurology, Neurosurgery and Psychiatry, 23*, 56–62.

Harris, J. G., Kongs, S., Allensworth, D., Martin, L., Tregellas, J., Sullivan, B., et al. (2004). Effects of nicotine on cognitive deficits in schizophrenia. *Neuropsychopharmacology, 29*(7), 1378–1385.

Heatherton, T. F., Kozlowski, L. T., Frecker, R. C., & Fagerstrom, K. O. (1991). The fagerstrom test for nicotine dependence: A revision of the fagerstrom tolerance questionnaire. *British Journal of Addiction, 86*(9), 1119–1127.

Himelhoch, S., & Daumit, G. (2003). To whom do psychiatrists offer smoking cessation counseling? *American Journal of Psychiatry, 160*(12), 2228–2230.

Hrywna, M., Delnevo, C., Williams, J., Vorbach, U., Ernst, G., & Gundersen, D. (October, 2007). *Use of quitline by smokers with mental illness*. Presentation at the national conference on tobacco or health, Minneapolis, Minnesota. Retrieved from http://ncth.confex.com/ncth/2007/techprogram/P14690.HTM.

Hughes, J. R., & Carpenter, M. J. (2006). Does reduction increase future cessation and decrease disease risk? A qualitative review. *Nicotine & Tobacco Research, 8*(6), 739–749.

Hughes, J. R., Cummings, K. M., & Hyland, A. (1999). Ability of smokers to reduce their smoking and its association with future smoking cessation. *Addiction, 94*(1), 109–114.

Hughes, J. R., Hatsukami, D. K., Mitchell, J. E., & Dahlgren, L. A. (1986). Prevalence of smoking among psychiatric outpatients. *American Journal of Psychiatry, 143*(8), 993–997.

National Institutes of Health. (2006). State-of-the-Science conference statement: Tobacco use: Prevention, cessation, and control. *Annals of Internal Medicine, 145*, 839–844.

Joukamaa, M., Heliovaara, M., Knekt, P., Aromaa, A., Raitasalo, R., & Lehtinen, V. (2001). Mental disorders and cause-specific mortality. *British Journal of Psychiatry, 179*(6), 498–502.

Kalman, D., Morisette, S. B., & George, T. P. (2005). Co-morbidity of smoking in patients with psychiatric and substance use disorders. *American Journal of Addiction, 14*, 106–123.

Killen, J. D., Fortmann, S. P., Schatzberg, A., Hayward, C., & Varady, A. (2003). Onset of major depression during treatment for nicotine dependence. *Addictive Behaviors, 28*, 461–470.

Kreinbring, B. L., & Dale, L. (October, 2007). *A quitline experience providing counseling to callers with mental illnesses.* Abstract from the national conference on tobacco or health, Minneapolis, Minnesota. Retrieved from http://ncth.confex.com/ncth/2007/techprogram/P14833.HTM.

Lasser, K., Boyd, J. W., Woolhandler, S., Himmelstein, D. U., McCormick, D., & Bor, D. H. (2000). Smoking and mental illness: A population-based prevalence study. *Journal of the American Medical Association, 284*, 2606–2610.

Lawn, S., & Pols, R. (2005). Smoking bans in psychiatric inpatient settings? A review of the research. *The Australian and New Zealand Journal of Psychiatry, 39*, 866–885.

Mauer, B. (2006). Morbidity and mortality in people with serious mental illnesses. In J. Parks, D. Svendsen, P. Singer, & M. E. Foti (Eds.), *Technical report 13*. Alexandria Virginia: National Association of State Mental Health Program Directors Council.

McAfee, T., Tutty, S., Wassum, K., & Roberts, A. (2009). *Mental health and quitlines: perspectives and a pilot study of a functional assessment. Part of a the moderated session- Do people with mental illnesses and substance use disorders have equal access to quitlines and other smoking cessation services? Should they?* Annual conference of the North American quitline consortium, Phoenix Arizona. Retrieved from http://www.naquitline.org/resource/resmgr/2009_conference_materials/s3mhmcafee.pdf.

McDermott, L., Dobson, A., & Owen, N. (2008). Smoking reduction and cessation among young adult women: A 7-year prospective analysis. *Nicotine & Tobacco Research, 10*(9), 1457–1466.

McFall, M., Saxon, A. J., Thompson, C. E., Yoshimoto, D., Malte, C., Straits-Troster, K., et al. (2005). Improving the rates of quitting smoking for veterans with posttraumatic stress disorder. *American Journal of Psychiatry, 162*(7), 1311–1319.

Morris, C. D., Giese, A. A., Turnbull, J. J., Dickinson, M., & Johnson-Nagel, N. (2006). Predictors of tobacco use among persons with mental illnesses in a statewide population. *Psychiatric Services, 57*(7), 1035–1038.

Morris, C. D., Tedeschi, G. J., Waxmonsky, J. A., May, M., & Giese, A. A. (2009a). Tobacco quitlines and persons with mental illnesses: Perspectives, practice and direction. *Journal of American Psychiatric Nurses Association., 15*, 32–40.

Morris, C. D., Waxmonsky, J. A., May, M. G., & Giese, A. A. (2009b). What do persons with mental illnesses need to quit smoking? Mental health consumer and provider perspectives. *Psychiatric Rehabilitation Journal, 32*(4), 276–284.

Murali, V., & Oyebode, F. (2004). Poverty, social inequality and mental health. *Advances in Psychiatric Treatment, 10*, 216–224.

Osby, U., Correia, N., Brandt, L., Ekbom, A., & Sparen, P. (2000). Time trends in schizophrenia mortality in Stockholm county, Sweden: Cohort study. *British Medical Journal, 321*(7259), 483–484.

Overall, J. E., & Gorham, D. R. (1962). The brief psychiatric rating scale. *Psychological Reports, 10*, 799–812.

Prochaska, J. J., Gill, P., & Hall, S. M. (2004). *Impact of nicotine withdrawal on an adult inpatient psychiatry unit. Presented at the 10th annual meeting of the society for research on nicotine and tobacco*. Arizona: Scottsdale.

Prochaska, J. J., Hall, S. M., & Bero, L. A. (2007a). Tobacco use among individuals with schizophrenia: what role has the tobacco industry played? *Schizophrenia Bulletin, 34*(3), 555–567.

Prochaska, J. J., Hall, S. M., Tsoh, J. Y., Eisendrath, S., Rossi, J. S., Redding, C. A., et al. (2008). Treating tobacco dependence in clinically depressed smokers: Effect of smoking cessation on mental health functioning. *American Journal of Public Health, 98*(3), 446–448.

Prochaska, J. J., Rossi, J. S., Redding, C. A., Rosen, A. B., Tsoh, J. Y., Humfleet, G. L., et al. (2007b). Depressed smokers and stage of change: Implications for treatment interventions. *Drug and Alcohol Dependence, 76*(2), 143–151.

Schroeder, S. A. (2009). A 51-year-old woman with bipolar disease who wants to quit smoking. *Journal of the American Medical Association, 301*, 522–531.

Siru, R., Hulse, G. K., & Tait, R. J. (2009). Assessing motivation to quit smoking in people with mental illness: A review. *Addiction, 104*(5), 719–733.

Smith, S., Bushe, C. J., Eriksson, C., Harrison, T., Holmes, R., Mynors-Wallis, L., et al. (2007). A well-being programme in severe mental illness. Reducing risk for physical ill-health: A post-programme service evaluation at 2 years. *European Psychiatry, 22*(7), 413–418.

Snyder, C. R., Sympson, S. C., Ybasco, F. C., Borders, T. F., Babyak, M. A., & Higgins, R. L. (1996). Development and validation of the state hope scale. *Journal of Personality and Social Psychology, 70*(2), 321–335.

Stead, L. F., Perera, R., & Lancaster, T. (2007). A systematic review of interventions for smokers who contact quitlines. *Tobacco Control, 16 Suppl 1*, i3–8.

Tedeschi, G., Zhu, S. H., & Herbert, K. (2009). *Reaching the core: Tailoring quitlines for ethnic minority smokers and those with mental illnesses*. Phoenix Arizona: Presentation at the National Conference on Tobacco or Health.

Thorndike, A. N., Stafford, R. S., & Rigotti, N. A. (2001). US physicians' treatment of smoking in outpatients with psychiatric diagnoses. *Nicotine & Tobacco Research, 3*(1), 85–91.

Tobacco Cessation Leadership Network. (2008). *Bringing everyone along resource guide*. Retrieved from http://www.tcln.org/pdfs/BEA_Resource_Guide-web.pdf.

Tønnesen, P. (2002). Smoking reduction for smokers not able or motivated to quit? *Respiration, 69*, 475–478.

Ware, J., Jr., Kosinski, M., & Keller, S. D. (1996). A 12-item short-form health survey: Construction of scales and preliminary tests of reliability and validity. *Medical Care, 34*(3), 220–233.

Williams, J. M., & Ziedonis, D. (2004). Addressing tobacco among individuals with a mental illness or an addiction. *Addictive Behaviors, 29*(6), 1067–1083.

Zhu, S. H., Anderson, C. M., Tedeschi, G. J., Rosbrook, B., Johnson, C. E., Byrd, M., et al. (2002). Evidence of real-world effectiveness of a telephone quitline for smokers. *New England Journal of Medicine, 347*(14), 1087–1093.

Ziedonis, D., Hitsman, B., Beckham, J. C., Zvolensky, M., Adler, L. E., Audrain-McGovern, J., et al. (2008). Tobacco use and cessation in psychiatric disorders: National Institute of Mental Health report. *Nicotine & Tobacco Research, 10*(12), 1691–1715.

Ziedonis, D. M., Kosten, T. R., Glazer, W. M., & Frances, R. J. (1994). Nicotine dependence and schizophrenia. *Hospital & Community Psychiatry, 45*(3), 204–206.

Ziedonis, D., Williams, J. M., & Smelson, D. (2003). Serious mental illness and tobacco addiction: A model program to address this common but neglected issue. *American Journal of the Medical Sciences, 326*(4), 223–230.

Zvolensky, M. J., Baker, K., Yartz, A. R., Gregor, K., Leen-Feldner, E., & Feldner, M. T. (2005). Mental health professionals with a specialty in anxiety disorders: Knowledge, training, and perceived competence in smoking cessation practices. *Cognitive and Behavioral Practice, 12*, 312–318.