Residential Smoking Therapy

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OBJECTIVE: **To evaluate a pilot 4-day residential smoking treatment program for smokers who had relapsed after participation in an outpatient smoking program.**

DESIGN: **A single-arm clinical trial. Participants stayed in a supportive, smoke-free environment for 4 days during which they attended educational sessions on nutrition, exercise, and psychology. Nicotine withdrawal was treated with nicotine inhalers and patches. After discharge, participants attended monthly outpatient group sessions for 6 months.**

SETTING: **The Durham, NC Veterans Affairs Medical Center residential unit.**

PARTICIPANTS: **Twenty-three medical outpatient smokers.**

MEASUREMENTS: **Seven-day point prevalence smoking abstinence was determined by self-report of zero cigarettes smoked and verified by exhaled carbon monoxide <8 parts per million.**

MAIN RESULTS: **Participants' mean age was 57.4 years; 100% were male; 61% were Caucasian; and 39% were African American. The mean score on the Fagerström Test for Nicotine Dependence was 7.1 (SD 2.3). Daily nicotine doses ranged from the nicotine inhaler alone to 56 mg of transdermal nicotine plus nicotine inhaler. Verified smoking abstinence on discharge (after 4 days) was 21/23 or 91.3% (95% confidence interval [95% CI], 73 to 100). At 6 months, the 7-day point abstinence rate was 6/23 or 26.1% (95% CI, 15 to 36).**

CONCLUSIONS: **This pilot residential smoking treatment program was designed to assist smokers who relapsed after outpatient treatment. Four days of residential smoking therapy successfully relieved smoking withdrawal. At 6 months after discharge, participants maintained an abstinence rate comparable to other medical therapies for smoking.**

KEY WORDS: **smoking cessation; nicotine replacement.**
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The relationships between cigarette smoking and coronary artery disease (CAD), chronic obstructive pulmonary disease (COPD), peripheral vascular disease (PVD), many cancers, and cerebrovascular disease (CVD) are well known. These diagnoses represent 30% to 50% of admissions to Veterans Affairs (VA) hospitals.[1] Approximately 60% of veterans are cigarette smokers, as compared with approximately 25% of the general population.[2] The high prevalence of smoking in veterans exists despite the availability of outpatient smoking treatment programs at many VA hospitals. Alternative treatment programs are needed to help prevent the morbidity associated with smoking, especially because it has been shown that the benefits of smoking cessation accrue even when a smoker is over age 65, or after CAD or COPD develop.[3]

Current outpatient smoking therapies include self-help programs (Nicotine Anonymous), cognitive-behavioral group therapy, nicotine replacement therapies (patch, gum, spray, inhaler), and bupropion (Zyban). Success in achieving smoking abstinence with these methods ranges from 9% to 40% in different studies.[4–7] Inpatient smoking treatment consults represent another model for treating smoking dependence. Treatment programs based on inpatient consults on medical and surgical wards have reported quit rates of 15% at 12 months (compared to 8% quit rates in controls).[8,9] An alternative approach to these programs is residential therapy.

With residential cigarette smoking therapy, patients live in a controlled environment during the cessation period. Residential treatment provides the patient with a secure, smoke-free environment that may not be available in a nonresidential setting. Combining this environment with therapy available as an outpatient may achieve smoking cessation in patients who have relapsed after smoking cessation attempts in the past. One theoretical reason for developing residential smoking treatment programs is based on the knowledge that smoking abstinence on the quit date increases the chance of long-term abstinence 10-fold.[10] Residential therapy allows a controlled environment presumably free of smoking cues on the quit date. Furthermore, successful abstinence has been correlated with the frequency and duration of the intervention.[11,12] Residential therapy provides the opportunity to increase the frequency of counseling interventions.

This pilot residential smoking treatment program was conducted to evaluate a residential cigarette smoking therapy program in veterans with comorbid illness who had relapsed after outpatient therapy, and to observe whether smoking abstinence could be achieved with a shorter residential stay than has been used in other residential programs.

METHODS

An intervention model for treatment of severe nicotine dependence was developed using the Durham VA Quit Smart Stop Smoking Clinic,[13] resources from the Loma Linda residential smoking treatment program (L. Ferry, MD, unpublished data, 2000), and published reports about existing residential programs.[14] The Durham VA smoking clinic is a 6-week group program led by psychologists and supported by pharmacists and physicians. It consists of 3

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outpatient visits of 2 hours each, 2 weeks apart. At the first visit, the patient learns about brand switching and reducing the number of cigarettes smoked each day. Bupropion is prescribed at this visit, if appropriate. The next visit is the quit date, during which the patient learns relapse prevention strategies, and is prescribed nicotine replacement. At the third visit, success at smoking abstinence is monitored, and relapse prevention is reviewed, if appropriate. The self-reported, 7-day point abstinence rate of the outpatient program was 25% at 3 months in 1999.

The residential model facilitates participants' efforts to quit smoking by providing a supportive, smoke-free environment, by providing medical counseling and nicotine replacement, and by teaching skills for smoke-free living. The program was developed and staffed by the psychologists who lead the outpatient cigarette smoking therapy program and physicians familiar with smoking therapy, in conjunction with nutritionists, nursing managers, wellness nurses, exercise physiologists, and pharmacists. All of these disciplines were incorporated into an hour-by-hour schedule for the residential program. The Durham Veteran Affairs Medical Center (DVAMC) Institutional Review Board approved the protocol and written informed consent was obtained from each participant.

The recruitment of participants began by a review of patients who had attended the DVAMC outpatient smoking program from February 1998 through January 2000. There were 337 individual outpatient clinic visits, of which 141 were repeat visits by the same patient. For the remaining 196 visits, charts were reviewed to identify and include veterans who were still smoking and had medical illnesses related to cigarette smoking (e.g., COPD, CAD, CVD, and PVD), or had a cardiac risk factor other than smoking (e.g., hyperlipidemia, hypertension, family history, or diabetes). Eligibility was limited to patients with smoking-associated chronic illnesses or cardiovascular disease risk factors because these patients are at highest risk for developing further smoking-related morbidity or mortality. Patients with uncontrolled or severe psychiatric disease (such as severe depression, schizophrenia, and bipolar disorder) or with medical illness that required nursing care were excluded. Eighty patients were excluded based on these criteria. Of the remaining 116 patients, 32 of the patients could not be contacted, 22 of the patients were no longer smoking, and 8 patients were not interested in the residential smoking program. Of the remaining 54 patients, 24 participants were enrolled in the program. The participants received a letter of explanation and a phone call a week before the residential stay as a reminder. The service was provided at no cost, but the program did require travel and time commitments from all participants.

Outline of Program

Participants were admitted in groups of 8 to one large, open, 8-bed room in the overnight lodger area of the DVAMC. The lodger area is a patient ward where there is an attendant on duty, but no nursing care. Participants were admitted to the lodger area on a Wednesday afternoon, and discharged on a Saturday morning. The program was named "Camp Kick Butts," with the shared room lending a camp-like atmosphere. A central area in the room was supplied with healthy food choices such as fruit, low-salt nuts, and sugar-free candies; games; and motivational posters. The VA hospital, including the lodger area, is a nonsmoking facility; patients are required to walk to designated areas outside of the building in order to smoke.

On arrival at the hospital, participants met in a group. Informed consent was obtained and participants completed the following questionnaires: Fagerström Test for Nicotine Dependence (FTND),[15] a craving questionnaire (Shiffman-Jarvik),[16] and baseline demographic information. Nicotine patch therapy was started within 3 hours of arrival at the program and was based on number of cigarettes smoked per day in a 1 mg nicotine-to-1 cigarette dosing.[17] Nicotine patches were used to provide basal levels of withdrawal relief, while nicotine inhalers were used for "breakthrough craving."

In the initial group, the study coordinator presented an orientation of the program, explained program policies, and collected tobacco products. Identification badges and orientation packets with schedules, policy reminders, and educational information were issued. Baseline carbon monoxide (CO) levels were measured.[18,19] A psychologist who specializes in smoking cessation mediated an hour-long discussion regarding issues of behavioral modification therapy. In the following 3 days, participants attended nutrition, exercise, psychology, and recreational therapy and educational sessions in a supportive and smoke-free environment. Participants were paired into "buddies" on admission and were encouraged to stay together to support each other.

Schedules were rigidly structured in order to divert attention away from cigarette cravings (Table 1). Physicians rounded on each participant every morning starting at

Table 1. Example of Day One Activities

6:30 Wake up
7:15 Breakfast
7:30 Rounds/individual counseling/CO testing and assessment of craving/explanation of nicotine replacement therapies
9:00 Nutrition
10:00 Exercise
11:00 Rest
12:00 Lunch
1:00 Anger management
2:00 Group therapy/psychology
3:30 Continued behavior health classes
5:00 Dinner
6:00 Nicotine Anonymous
7:00 Recreational therapy and CO testing

CO, carbon monoxide.

7:30 AM. Daily discussions on rounds revolved around cigarette craving and self-report of abstinence,[20] side effects from nicotine replacement, nicotine withdrawal symptoms, and other medical symptoms such as shortness of breath or chest pain. Expired CO levels were monitored during this time. During the day, participants were encouraged to stay with the group or with their "buddy." No formal restrictions against leaving the VA campus existed. Expired CO levels were monitored a second time at 7 PM.

After discharge on Saturday morning, participants returned the following Monday for follow-up. The participants completed an evaluation on discharge with specific agree/disagree statements and a qualitative comment section. They returned monthly for 6 months after discharge. At follow-up visits, participants were asked if they had smoked both since their 4-day stay (continuous abstinence) and in the previous 7 days (7-day point abstinence); expired CO levels were measured; and relapse prevention was reviewed. Participants also offered their own advice based on their experiences at home.

Nicotine-Replacement Therapy

During the residential stay, nicotine withdrawal was evaluated by self-report twice a day and by a 7-point craving scale once a day.[16] Nicotine replacement therapy (NRT) was adjusted daily on the basis of cigarette craving or nicotine side effects. Participants reported any new symptoms to the program coordinator both during the residential stay and on follow-up visits. Symptoms of nausea, diarrhea, headache, chest pain and shortness of breath were specifically elicited from each participant. The program coordinator revised medication orders, and participants picked up their medications from the VA pharmacy located in the hospital in the mornings after rounds.

Participants remained on their discharge nicotine patch and inhaler doses until the first follow-up 2 days after discharge. Nicotine doses were decreased if cigarette craving was controlled at subsequent follow-up visits. At each follow-up visit, cigarette craving, medication side effects, nicotine dose used, and nicotine withdrawal symptoms were evaluated. Nicotine medication was adjusted on the basis of these factors.

Group Components

The "Twelve Steps" approach to cigarette smoking cessation was discussed the first evening in the hospital, using Nicotine Anonymous literature (www.nicotineanonymous.org). In the subsequent 3 days, participants' mornings were composed of physician rounds, exercise, and wellness and nutrition classes, whereas afternoons typically consisted of 2 hours of group therapy. In the group therapy, personal issues and feelings about progress toward recovery were explored. Typical concerns addressed included nicotine-dependence issues, marital issues, and stressors in the home or workplace. The principles of chemical dependence treatment were taught in lectures and applied individually. Behavioral techniques were taught and demonstrated by group members.

Special sessions were reserved for anger management and stress management. These sessions emphasized behavioral rehearsal with active participant involvement. Stress management sessions dealt with issues that participants offered as both the most troublesome and the most feared as relapse triggers. Patients learned and practiced skills including problem solving, relaxation training, conflict resolution, time management, and assertiveness.

Relapse prevention skill development was the central feature of the final 2 group sessions. Participants discussed how it felt not to smoke, reviewed coping skills, and planned for future relapse prevention. The study coordinator led an outing to clean out participants' cars of all cigarettes and ashes, which fostered further discussions about relapse and anxiety surrounding participants' trips home from the hospital.

Diet and Nutrition

Participants attended an hour-long session planned specifically for teaching nutrition to a new nonsmoker. Dietary goals were to establish a healthy eating pattern and specifically address the potential for weight gain after smoking cessation. A pre- and post-test was administered to assess learning. Recipes and literature were provided to participants for use at home.

Exercise

The research study coordinator received training on leading exercise sessions from the VA exercise physiologist and led 2 exercise sessions in the patient exercise area of the hospital. Participants exercised 15 to 25 minutes on weight machines, stationary bicycles, and treadmills to achieve a mild feeling of exertion. Benefits of regular aerobic exercise and how exercise can be integrated into daily routines were discussed during these sessions.

Statistical Analysis

Smoking abstinence was determined by self-report of no cigarettes smoked in the past 7 days and by exhaled carbon monoxide <8 parts per million (ppm). The exhaled carbon monoxide levels were corrected for background carbon monoxide. Means and standard deviations were reported for continuous variables; proportions were reported for categorical variables. All analyses were performed using SAS statistical software version 8.0 (SAS Institute, Inc., Cary, NC).

RESULTS

Twenty-three participants successfully completed the 4-day residential program component. Mean age of the participants was 57.4 years (SD 8.7), 61% were Caucasian, 39% were African American, and all participants were men. The mean number of years of education was 12.8 (SD 2.4).

Table 2. Baseline Characteristics

Characteristic	All Participants, Mean (SD)	Participants not Smoking at 6 Months, Mean (SD)
Age, y	57.4 (8.7)	52.0 (8.7)
Male, %	100.0	100.0
Race, % white	61.0	33.0
Education level, y	12.8 (2.4)	13.2 (2.6)
Psychiatric history, %	39.1	33.3
FTND score	7.1 (2.3)	7.3 (2.1)
Cigarettes smoked/d, *n*	25.2 (13.7)	19.1 (9.2)
Previous quit attempts, *n*	2.9 (1.5), range 2–5	2.2 (0.8)
Longest period of past cessation, wk	21.1 (22)	27.5 (20.8)
Age started smoking, y	15.0 (3.6)	15.3 (2.6)

FTND, Fagerström Test for Nicotine Dependence.

Thirty-nine percent of participants (9/23) had a psychiatric diagnosis. Three participants had depression, 3 participants had posttraumatic stress disorder, and 3 participants had a history of alcohol dependence. The mean number of cigarettes smoked per day was 25.2 (SD 13.7), and the mean FTND score was 7.1 (SD 2.3). The range of quit attempts was 2 to >5 attempts. The mean age of starting smoking was 15.0 years (SD 3.6), and the mean duration of longest previous period of smoking abstinence was 21.1 (SD 22.0) weeks (Table 2).

Program

Daily nicotine doses ranged from no nicotine replacement to 56 mg of transdermal nicotine plus nicotine inhaler use.[21] The mean and median nicotine patch daily dose at discharge was 21 mg (SD for mean, 19). At discharge on the fourth day, 16/23 (69.5%) participants were using a nicotine inhaler, and 15/23 (65.2%) were using nicotine patches. At 6 months, no participant was using nicotine patches, but 5/23 (22%) were still using the nicotine inhaler. The mean carbon monoxide level at baseline was 19.3 ppm (SD 8.2, range 5 to 37 ppm). The mean CO levels for the next 3 mornings were: 7.2 ppm (SD 3) on morning 2, 5.4 ppm (SD 1.4) on morning 3, and 4.8 ppm (SD 1.6) on morning 4.

Only 1 participant left the VA hospital area temporarily during the program (with his buddy) and had an expired CO level of 3 ppm on return. All participants were present at morning and evening rounds, psychology sessions, and nutrition group sessions. Three participants did not participate in exercise groups because of fatigue. One potential participant was excluded from lodger unit admission on the first day secondary to uncontrolled psychiatric illness. One-56 year-old participant with CAD, who had returned to smoking after 30 days, died after the fourth month of the program.

Smoking Abstinence

Twenty-one of 23 participants (91%; 95% confidence interval [95% CI], 73 to 100) remained abstinent from smoking during the 4-day hospitalization. The 2 participants who smoked in the hospital remained in relapse at monthly follow-up visits. The number of participants present at follow-up sessions declined over time with 21/23 participants attending the first-month follow-up and a nadir of 11/23 participants attending the fifth-month follow- up. Participants were assumed to be smoking if they were not present. Table 3 outlines verified (by CO levels <8 ppm) 7-day point prevalence abstinence at various intervals during the program. At 1 month, 15/23 (65%; 95% CI, 38 to 91) participants were not smoking, and at 6 months 6/23 (26%; 95% CI, 15 to 36) participants were not smoking.

Side Effects

During the residential portion of the intervention, 2 participants experienced mild nausea and diarrhea within a few hours of nicotine patch use, which resolved after dose reduction. After 3 months, 2 participants experienced skin irritation from nicotine patch use, which resolved on discontinuing the patch.

Program Evaluation

In nutrition sessions, participants demonstrated a 50% to 67% improvement in knowledge. On the day of discharge, participants were surveyed to evaluate the treatment program. Ninety percent (21/23) of participants rated the group sessions as excellent. The participants unanimously agreed with the statement that the 4-day stay was long enough to achieve their goals and with the statement that they needed the support of fellow "campers." All participants recommended this program to other veterans unable to stop smoking with standard methods. All participants disagreed with the statement that the program could be effectively implemented on an outpatient basis, using the same medications and attending the same groups and classes.

DISCUSSION

This pilot study demonstrates the feasibility of providing residential smoking therapy over 4 days using existing

Table 3. Seven-day Point Prevalence Smoking Abstinence Verified by Expired Carbon Monoxide of <8 ppm

	Participants Abstinent, *n* (%)	95% Confidence Interval
Discharge	21 (91.3)	73 to 100
1 Month	15 (65.2)	38 to 91
3 Months	10 (43.5)	25 to 61
6 Months	6 (26.1)	15 to 36

ppm, parts per million.

resources within 1 medical center. Because of the severity of dependence in these participants, a 7-day point prevalence smoking abstinence rate of 26% at 6 months represents a successful program. Seven patients had tried 5 or more times to quit, and the population as a whole was severely nicotine dependent, as evidenced by their nicotine dependence scores, smoking histories, and smoking-related diseases. All participants had completed structured, 6-week outpatient smoking cessation programs prior to the study with subsequent relapse.

In comparison to other residential programs, this study reports the shortest residential stay that has been attempted for this type of smoking treatment. Other residential programs have used hospital stays lasting 7 to 14 days.[14,22] (L. Ferry, MD, unpublished data, 2000) Based on follow-up with the participants of this study and on evaluating the causes for relapse, a longer stay might not have prevented relapse, because many participants returned to smoking because of common stressors at home, which would have been encountered after any length of residential stay. A longer stay, however, might have prepared the participants to better handle relapse situations when they did arise.

At the Mayo Clinic residential pilot program, patients were admitted for 2 weeks in groups of 6, and were treated with a combination of behavioral, chemical-dependence, and transdermal NRT. At 1 year, 7 of 24 patients (29%; 95% CI, 13 to 51) had maintained continued abstinence from smoking. Success was attributed to the smoke-free environment with a change in the daily routine and absence of the usual cues to smoke.[14] Since completion of their pilot program, the Mayo program has shortened the residential stay to 8 days. The shorter Mayo Clinic residential program has reported 7-day point prevalence 6-month cessation rates of 45%.[22]

Another residential smoking cessation program at a VAMC exists at Loma Linda, California (L. Ferry, MD, unpublished data, 2000) At the time of our communication, 35 veterans had completed their program, including 1 group of 6 women. The participants were admitted to the VA overnight stay area in groups of 6 to 12 participants for 7 days, and were treated with bupropion, nicotine replacement, relapse prevention education, group therapy, and stress management discussions. Follow-up occurred every 48 hours for 2 meetings after discharge, then every week for 2 weeks, then every month for 6 months, with a final 1-year visit. Of the 8 patients in the pilot study, the 7-day point prevalence rate at 12 months was 75%. The 7-day point prevalence cessation rate for the next 12 patients was 67% at 6 months.

There are several possible reasons why our cessation rates were lower than those of other residential smoking therapy programs. Unlike the Mayo Clinic program, our program required no monetary cost to the patient. The lack of monetary investment may have resulted in lower levels of motivation. Also, compared to the Mayo pilot program demographic data, our participants started smoking at a younger age and had lower levels of education, which may have contributed to the lower success rate. As compared to the Loma Linda VA program, our program did not utilize buproprion and had less frequent outpatient follow-up meetings.

Nicotine doses in this study were higher than doses used in the outpatient smoking clinic and in published studies. The residential stay made it possible to titrate nicotine doses daily on the basis of cigarette cravings and to rapidly address side effects of NRT. As a result, the concurrent use of 2 types of NRT could be monitored closely.

Residential smoking therapy costs more than the outpatient smoking cessation therapies that have been found to be very cost effective ($2,000–$9,000 per life-year gained).[23] For this program, the major expense was nicotine replacement medications. On average, the cost of this program at the VA was $300 per patient, with a range of $240–$480 for nicotine replacement therapy. Meals averaged $40 per participant. Staff donated time, and existing space was utilized within the VA, but this is unlikely to translate to most other settings. A reimbursement system is not currently in place for most smoking cessation interventions of this kind, but as increases in tobacco dependence treatment dollars are being considered as part of proposed legislation, excise taxes, and tobacco settlements, this type of program might be considered for funding in the future.

To extend this program to other settings, reimbursement for physicians, psychologists, and nutritionists should be considered. In academic settings, assigning psychology residents and medicine residents on ambulatory rotations might be a feasible way to staff rounds and sessions while providing an educational experience in patient education and smoking therapy. After cost and manpower, space is the third major constraint in creating this type of program de novo, and overnight stay areas that are usually utilized by ambulatory patients or patient families might be the easiest to secure for this type of intervention. Unutilized wards might be useful for these types of programs if they remain furnished and security for patients can be assured. Many academic centers also have research units that might be available for a residential cigarette smoking treatment program.

There are a few limitations to our study. A sampling bias may exist because of choosing participants who were motivated enough to complete an outpatient smoking program in the past. This, however, also probably biased our participants toward those who were more nicotine dependent and who thus may have been less likely to successfully quit smoking. The residential treatment is a limited resource, so we included only participants who had already exhausted the less-expensive, more-available options. We attempted to correct the bias inherent in self-report of smoking abstinence by monitoring exhaled CO levels. However, these levels are positive only up to 12 hours after smoking, so our 7-day point abstinence values rely on participants' self-report.

It is difficult to measure the amount that the cognitive-behavioral intervention, the nicotine replacement therapy, and the protected environment each contributed to a successful quit attempt for each patient. Further research is needed to determine which components contributed most to the success of the program. A randomized, controlled trial of residential smoking therapy compared to an outpatient smoking treatment program integrating similar elements of NRT, cognitive-behavioral therapy, group dynamics, nutrition classes, and exercise sessions would help to determine the usefulness of the residential component beyond other standard treatment strategies.

This residential treatment program utilized several components including a 4-day hospital overnight stay, combination nicotine replacement therapy, and behavioral classes to achieve cessation in smokers who had relapsed after outpatient therapy. The 6-month cessation rate of 26% was comparable to cessation rates of outpatient nicotine dependence treatment programs. Moreover, this rate was achieved in a group of recalcitrant smokers, using existing resources in a medical center. Given the profound benefits of smoking cessation, residential smoking therapy should be considered for smokers who have relapsed after participation in outpatient programs. In addition, further research of residential programs is necessary to determine the optimal approach.

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