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Patient Perception of How Smoking Status Influences Cardiac Rehabilitation Attendance after an Acute Cardiac Hospitalization

Hayden Riley, MS^{a,b,c}, Samuel Headley, PhD^b, Peter K Lindenauer, MD, MSc^{d,e,f}, Sarah Goff, MD^{d,f}, Heidi Szalai, MS^g, Diann E. Gaalema^h, and Quinn R. Pack, MD, MSc^{a,d,g}

^aDivision of Cardiovascular Medicine, Baystate Medical Center, Springfield, MA

^bDepartment of Exercise Science and Sports Studies, Springfield College, Springfield, MA

^cCardiac and Pulmonary Rehabilitation, The Miriam Hospital, Providence, RI

^dInstitute for Health Care Delivery and Population Science, Baystate Medical Center, Springfield, MA

^eDepartment of Internal Medicine, Baystate Medical Center, Springfield, MA

^fUniversity of Massachusetts Medical School at Baystate, Springfield MA

^gDivision of Cardiology, Baystate Medical Center, Springfield, MA

^hDepartment of Psychiatry, University of Vermont, Burlington, VT

Abstract

Background—Patients hospitalized with a cardiac condition are less likely to attend cardiac rehabilitation (CR) if they are smokers despite the benefits of doing so. The present study sought to investigate how, if at all, a patient's decision to attend CR was influenced by their tobacco use post-discharge.

Methods—We surveyed smokers during their hospitalization for a cardiac condition. Four to eight weeks after discharge, a follow-up survey assessed self-reported CR attendance, smoking cessation (SC), and patient opinion of how their smoking status influenced CR attendance.

Results—Of the 81 patients who completed the baseline survey (68% male, 57 ± 10 years), 62 (77%) completed the follow-up survey. Consistent with prior findings, there was a substantial correlation between SC and CR attendance (OR 16.0, $p < 0.001$) with 36 (44%) patients attending CR overall and 38 (47%) abstaining from smoking. Patients reported a wide variety of reasons for not attending CR, but most patients ($n=39$, 63%) reported that their smoking status did not influence their decision to attend CR. However, 5 patients (8%) reported attending CR because they successfully quit smoking, and 5 (8%) attended CR anticipating support with SC.

Conclusion—A strong relationship exists between SC and CR attendance following a cardiac hospitalization; however, the majority of patients did not feel that their smoking status was a factor

in their decision to attend CR. Regardless of reason, it appears that success with one behavior may be related to the other and that both SC and CR attendance should be encouraged.

Introduction

Nearly half of all deaths that occur in the United States can be attributed to modifiable behaviors such as tobacco use, poor diet, and physical inactivity¹. Smoking remains the leading preventable cause of mortality, and smoking cessation (SC) is the most important lifestyle change a patient can make to reduce future morbidity and mortality following a myocardial infarction². Although nationally, only 18% of US adults are smokers, 27–36% of patients hospitalized for an acute cardiac condition are smokers, with more than 60% of them continuing to smoke following hospital discharge³. These facts suggest that SC should be a primary focus of secondary prevention for patients with heart disease and that identifying factors associated with sustained SC after hospitalization are essential to helping patients remain abstinent. Unfortunately, the majority of patients leave the hospital without being offered proven SC interventions and attempts to quit are often unaided and therefore unsuccessful.^{4–6}

Cardiac rehabilitation (CR) attendance significantly reduces morbidity and mortality in cardiac patients⁷. These improvements are likely due to CR's role in modifying three primary risk factors: tobacco use, poor diet, and physical inactivity¹. CR is a comprehensive and medically supervised outpatient program that is designed to assist patients diagnosed with a cardiovascular condition in the management of modifiable risk factors and the treatment of their disease. Considering that observational studies have shown that CR attendance (vs non-attendance) was associated with higher SC rates, it has previously been suggested that attendance at CR may play a significant role in the long-term success of these patients^{8–11}. Unfortunately, current smokers are not only less likely to attend CR when compared to non-smokers, but those that do attend are less likely to complete the program as well¹².

The purpose of the present study was to investigate how current smokers who are eligible to attend CR perceive smoking as a factor in their decision to attend or not attend. We hypothesized that patients who successfully abstain from smoking post-discharge would endorse using CR as a method to help them quit permanently.

Methods

We surveyed English-speaking patients admitted to Baystate Medical Center, a 700-bed hospital located in Springfield, MA, who were eligible for outpatient CR between October 2015 and May 2016 and were current smokers at the time of their hospital admission. Eligibility for CR was defined as patients hospitalized with a diagnosis of myocardial infarction (MI) or who underwent a percutaneous coronary intervention (PCI), coronary artery bypass graft (CABG), or valve repair or replacement. A current smoker was defined as a patient reporting having had a cigarette within the 30 days prior to hospital admission. This study was approved by the Baystate Medical Center and the Springfield College institutional review boards.

Inpatient Survey Administration

Full methods of the initial inpatient survey administration and full survey questions can be found in a prior publication¹⁴. Briefly, we recruited patients using a list of patients automatically referred for inpatient CR, who were referred based on having one of the aforementioned qualifying conditions. If a patient was found to be eligible for our study, they were provided with a verbal description of the purpose and procedure of the study, a written informed consent, and a copy of the inpatient questionnaires. The initial questionnaire was 29 questions in length, was carefully developed and cognitively tested for clarity, ease of use, and comprehensiveness, as previously described¹³. In this manuscript, we report on the results of questions 18–21, which are found in the online Appendix. These questions focused on intentions to attend CR. If a patient indicated they were not planning to attend, they were asked to explain why.

Outpatient Follow-Up

Follow-up surveys were administered via telephone or mail based upon patient preference at 4 weeks post hospitalization. If the initial survey was not completed, patients were contacted up to three times over a 4-week span a month following discharge. The follow-up survey consisted of the following four questions: (a) did you attend cardiac rehabilitation even one time? (b) if not, why did you not attend cardiac rehabilitation? (c) have you been completely abstinent from smoking in the past 7 days? and (d) how do you think your smoking behavior influenced your decision to attend/not attend cardiac rehabilitation? When administered over the phone, the researcher asked the questions pertaining to the follow-up survey and the patient responses were recorded by the researcher verbatim. Recorded responses were read back to the patient to assess for clarity and completeness and to assure the wording and phrasing was recorded accurately. Answers provided via the mailed follow-up survey were recorded verbatim. If a patient no longer wanted to participate in the study, no further attempts to complete the follow-up survey occurred. Patients were given \$10 upon completion of the initial inpatient surveys and another \$10 following completion of outpatient follow-up.

Thematic Analysis

For both the inpatient and outpatient surveys, responses were grouped into common themes. Two co-authors (HR and QP) assessed the patient responses and themes in which they were grouped to ensure accuracy and consistency of categorization. The number of patients expressing particular themes were tallied and expressed as proportions. Representative quotes were selected to best show the variety and range of opinions about how intentions for smoking cessation, exercise, and CR attendance influenced each other, both at baseline and at the follow-up survey.

Statistical Analysis

We used REDCap, a secure, web-based database, to enter, monitor, and export data¹⁴. We classified patients who did not respond to the follow-up survey as not having attended CR

and not having remained abstinent from smoking, as has been done previously¹⁵. Considering that the majority of patients who smoke do not attend CR after a cardiac event, nor quit smoking, these assumptions are reasonable¹⁶. In sensitivity analysis, we analyzed the association between CR attendance and SC only among patients who answered the follow-up survey. Association between attending CR and SC was assessed using an odds ratio and relationship between baseline intention to attend CR and actual attendance was evaluated with a Chi-square test. We used JMP 12.0.1 (SAS institute, Cary NC) for all statistical analyses. An alpha level of 0.05 was used to determine statistical significance.

Results

Of the 105 patients approached, 83 (79%) consented to participate and 81 (77%) completed the inpatient questionnaires. Patient characteristics are found in Table 1, as published previously¹³. In general, participants were more often male, Caucasian, and diagnosed with myocardial infarction and/or percutaneous coronary intervention. On average, patients smoked 16 ± 9 cigarettes per day for 37 ± 13 years. Patients were asked on the initial questionnaire if they planned to attend CR, were considering attending CR, or planned to not attend. Overall, 34 (42%) of patients reported that they were planning to attend, whereas 29 (36%) were considering attending CR, and 18 (22%) were not planning to attend. Self-reported reasons for planned non-attendance can be found in Table 3. Even though the majority (78%) of patients reported that they planned to attend CR or were considering attending at baseline, only 36 (44%) patients had attended CR at the time of follow-up.

Of the initial 81 participants, 62 (77%) patients completed the follow-up survey via telephone (45%) or mail (55%). Only 38 (47%) of patients had been abstinent from smoking in the 7 days prior to their participation in the follow-up survey and 44% attended CR. As noted in prior studies, we found a strong correlation between smoking cessation at follow-up and CR attendance (OR 16.0, $p < 0.001$, See Table 2). Surprisingly, intention to attend CR at baseline was not predictive of attendance status at follow-up ($\chi^2 = 0.32$, $p = 0.85$). When patients who did not respond to our survey were excluded, there was a weaker, but still statistically significant association between these two behaviors (OR 3.0, $p = 0.037$). Regarding the discrepancy between intentions to attend and actual attendance, most patients stated that they were considering or planning to attend CR during their hospitalization but did not in fact attend at the time of follow-up. However, the opposite also occurred as patients who originally stated they would not attend CR ended up attending the program. Reasons reported for non-attendance at follow-up can be found in Table 4.

When asked how they felt their smoking behavior impacted their decision to attend or not attend CR, 39 (63%) felt that there was no impact, whereas 5 (8%) reported attending CR because they felt it would help them to quit smoking long-term, and 5 (8%) stated that they attended CR because they quit smoking (Table 5). For example, one patient reported, *"I feel better because of the exercise and I don't feel better when I smoke. CR makes me more likely to stay away from smoking."* Another patient said, *"If I attended I bet I would have stopped smoking because I was told they would help me."* The remainder of patients (13, 21%) did not provide a clear or complete response to the question.

Discussion

Among smokers eligible for CR, we found that only a minority of patients both quit smoking and attended CR within the first two months following discharge. We found that intention to attend, or not attend, CR during hospitalization was not predictive of CR attendance within the initial two months following discharge. We also found a strong association between successful SC at follow-up and CR attendance, which is in line with the existing evidence of the co-occurrence of these two behaviors^{8–11, 17}. This data suggests that success with one behavior is likely complemented by success with the other, or vice versa. However, despite the strong relationship between the two behaviors, when asked if patients felt their smoking status post-discharge influenced their decision to attend or not attend CR, the majority of patients reported no association between the two.

We hypothesized that patients who reported abstaining from smoking at the time of follow-up would endorse utilizing CR as a way to help them stay quit, but, for the most part, this was not seen. However, at follow-up, a few patients did in fact report using CR as a support system to help them quit smoking. Therefore, it seems that at least for some patients, CR may have had a direct influence on SC. This finding is consistent with previous literature which has shown that SC rates following MI were higher among individuals who were referred to CR¹⁹ and/or participated in a CR program when compared to those who reported not attending^{8–11}. Additionally, a prior study completed in a setting very similar to CR found that 50% of smokers succeeded in quitting smoking when they were offered a nurse-led rehabilitation intervention that consisted of SC education, dietary management, and physical activity, compared to 29% that simply attended routine follow-up appointments with their general practitioners²⁰. Moreover, even though rehabilitation following discharge can increase the success of SC, the most effective SC interventions are initiated during hospitalization and continue to support patients for several months after discharge^{21–22}. Considering that outpatient CR programs provide behavioral support for several months following discharge, it is likely that these programs could provide patients with the encouragement, support, and necessary resources they need to help them stay quit and avoid late relapse²².

On the other hand, there were a few patients who reported attending CR *because* they quit smoking. This suggests that successful SC may, at least for some patients, increase their likelihood of attending CR and corroborates the reports of several of our patients that they would be less likely to attend CR if they were to relapse or continue smoking¹³. This is also consistent with prior research that suggested an inverse relationship between nicotine dependence and physical activity, a major component to every CR program and supports the idea that individuals who continue smoking or relapse prior to initiating CR would be less likely to attend¹⁸. A reasonable explanation as to why dependence may decrease physical activity and therefore discourage individuals from attending CR may be that increased nicotine dependence is often associated with older age and other outcomes, such as depression, that are typically linked with physical inactivity¹⁹. Thus, while the majority of patients reported no association between SC and CR attendance, a few patients seem to use CR as a tool for SC support and a few others report attending CR because of initial success with SC.

Surprisingly, we found that a patient's reported intention to attend or not attend CR during hospitalization had no relationship to CR attendance at follow-up. This is consistent with prior studies, one of which 85% of patients indicated they would attend CR post-discharge, however, only 30% had attended a program within the first 10 weeks and an additional 25% were waiting to initiate a program²⁴. A possible explanation for the lack of correlation between intentions to attend and actual attendance/non-attendance may simply be social desirability bias. In addition, cognitive dissonance may play a role. For instance, patients who continue smoking and/or relapse may view initiating an exercise program or participating in CR as a behavior that is inconsistent with their inability to maintain abstinence, and not attend CR in an unconscious attempt to reduce cognitive dissonance. Another probable explanation could be the manifestation of barriers unknown to patients at the time of hospital referral²⁵. For instance, it has been thought that attendance at CR within the first several weeks post-discharge may be low, even among patients who are interested in attending, due to limited flexible programs that are accessible within a timely fashion²⁴. If programs could enroll patients at a faster rate due to an increase in availability of programs and/or hours, we believe it would lead to an increase CR attendance. Additionally, considering that the majority of smokers tend to relapse within the first few weeks after hospital discharge²⁶, decreasing the time that elapses between discharge and an initial CR appointment may increase rates of long-term smoking cessation by helping to prevent relapse. Interestingly, our study, also found planned non-attendance at baseline was not predictive of non-attendance at follow-up. Future work should further explore the association between intention to attend and attendance at CR among smokers.

Despite the lack of association between intentions to attend and actual attendance, 44% of patients in our study attended CR at follow-up, a percentage that exceeds the national average. This percentage falls in line with our program's historical enrollment rate which in 2014 was 43% among all eligible patients. We suspect that the consistency among attendance rates may be the result of two counterbalancing factors. First, because these patients consented to participate in a research study and were given substantial exposure and encouragement to attend CR, we suspect this increased participation rates. However, because our patients were smokers, we normally would expect significantly lower participation rates. Indeed, if we included the 22 patients who did not consent to participate in our survey (and assume that none of them attended CR) we would have observed a participation rate of 34% (36/105) which is substantially worse than our usual enrollment rate, but still somewhat better than national enrollment rates.

In terms of clinical implication and practice, we believe that CR professionals should counsel patients while hospitalized on the benefits of attending CR and successfully quitting smoking regardless of their stated intentions to attend CR. In addition, it is important to explore their hesitations and barriers in regard to both behaviors, and provide support. Moreover, considering the significant role exercise plays in CR, providers should educate patients regarding the benefit physical activity may provide in aiding a successful SC attempt. Research has shown that physical activity and exercise may reduce cravings and withdrawal symptoms, while also decreasing stress and tension related to smoking, improving concentration, and potentially helping to combat the weight gain that is often associated with quitting²⁷.

The primary limitation of this study was that SC and CR attendance were self-reported. In addition, during both the baseline and follow-up phases of our study, some patients were unwilling to participate. Even though our participation and follow-up response rates were high, our study may not be fully representative of all hospitalized smokers. Both SC and CR outcomes were assessed simultaneously and so it was not possible to directly assess the temporal relationship between these two events. In addition, because we classified all patients who did not respond to our follow-up survey as both smokers and non-CR attenders, the relationship between these behaviors may be artificially increased, although these behaviors were still strongly linked in our sensitivity analysis after excluding non-responders. Furthermore, only current smokers were enrolled in the study, therefore conclusions comparing attendance rates between smokers and non-smokers cannot be made. Additional limitations include that we had a small sample size, were limited to English speaking patients, and this study was performed at a single center in western Massachusetts. Consequently, our results may not uniformly apply to other institutions with significantly different patient population or clinical settings.

Conclusions

Our data supports a strong relationship between SC and CR attendance but it does not directly speak to whether these outcomes are associative or causative. Previous literature provides some evidence that CR helps to promote long-term SC; but is also shows that some patients who succeed in quitting smoking are more likely to attend CR. Given the strong association, it is possible that supporting one behavior outcome will synergistically lead to a subsequent increase in the other as well; however more literature is needed to address this hypothesis directly. Regardless of which outcome precedes the other, whether it is successful SC or CR attendance, it is evident that efforts need to be made to support both of these behavior changes among smokers hospitalized for an acute cardiac condition to reduce future morbidity and mortality in this vulnerable population.

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Table 1**Patient Characteristics**

Characteristic	(n = 81)
Age (years, mean $\pm$ SD)	57 $\pm$ 10
Male	56 (69%)
Body mass index (mean $\pm$ SD)	29.9 $\pm$ 6.0
Race	
• Non-Hispanic White	58 (72%)
• Other	10 (12%)
• Black	8 (10%)
• Hispanic	5 (6%)
Smoking History	
• Cigarettes per day	16 $\pm$ 9
• Number of years as an active smoker	37 $\pm$ 13
Qualifying Diagnosis	
• Myocardial Infarction (MI)	12 (15%)
• Percutaneous Coronary Intervention (PCI)	7 (9%)
• MI and PCI	43 (53%)
• CABG	11 (14%)
• Valve Procedure	6 (7%)
• CABG and Valve	1 (1%)
• Angina	1 (1%)
Education Level	
• Some High School	12 (15%)
• General Education Degree	8 (10%)
• High School Graduate	21 (26%)
• Some College	15 (19%)
• Trade, Technical, or Vocational Training	11 (14%)
• College Graduate	9 (11%)
• Post Graduate Degree	4 (5%)
Risk Factors	
• Diabetes Mellitus	19 (24%)
• Hypertension	46 (57%)
• Hyperlipidemia	31 (38%)
• History of Depression	17 (21%)
• Family History of CAD	39 (48%)
Questionnaire Scores	
• Fagerstrom Test for Nicotine Dependence	5.0 $\pm$ 2.4
• Anxiety (HADS)	7.6 $\pm$ 4.3
• Depression (HADS)	5.4 $\pm$ 3.8
• Confusion Hubbub and Order Scale	9.2 $\pm$ 4.3

SD = Standard Deviation, MI = Myocardial Infarction, PCI = Percutaneous Coronary Intervention, CABG = Coronary Artery Bypass Graft Surgery; NRT = Nicotine Replacement Therapy, CAD = Coronary Artery Disease, HADS = Hospital Anxiety and Depression Scale

Table 2

Attendance at Cardiac Rehabilitation and Smoking Abstinence at Follow-up.

OR 16.0, p <0.001		Attended CR*		
		Yes	No	Total
Remained Abstinent from Smoking *	Yes	26 (32%)	12 (15%)	38 (47%)
	No	10 (12%)	33 (41%)	43 (53%)
	Total	36 (44%)	45 (55%)	

* Assumes those who did not complete follow-up (N=19) did not attend CR and relapsed to smoking. If these patients are excluded, there is still a relationship between CR attendance and smoking cessation (OR 3.0, p = 0.037).

Table 3

Reasons for Planned Non-Attendance at CR during Baseline Evaluation

Please describe in a few words why you do not plan to attend CR. (n = 18)	
No need and/or desire to attend	
<i>I'll be fine on my own</i>	4 (22%)
<i>I don't care to exercise, it's not for me</i>	
Prefers to exercise on their own	
<i>I do plenty of exercise myself. I don't need cardiac rehab</i>	3 (17%)
<i>I'm going to exercise on my own</i>	
Other personal or family health concerns	
<i>My other health issues</i>	3 (17%)
<i>Sickness in family and family care responsibilities</i>	
No Response	3 (17%)
Issues with transportation or/or distance	
<i>I'm not willing to drive 45 minutes 3 times a week</i>	2 (11%)
Unable to make time commitment	
<i>I already work with OT and PT</i>	2 (11%)
Not fully informed about CR	
<i>I have not been fully informed on the benefits</i>	1 (5%)

Table 4

Reasons for Non-Attendance at CR Given at Follow-Up

Please describe in a few words why you did not attend CR.	(n = 27)
Other personal or family health concerns	
<i>I'm not ready; I'm not feeling my best most days and I still have chest pain</i>	6 (22%)
<i>My doctor wants me to go but my medications make me too tired</i>	
Lack of availability/issue with scheduling	
<i>I never got the date and time for the appointment</i>	4 (15%)
<i>There wasn't availability</i>	
Lack of insurance coverage	
<i>I can't attend because I don't have insurance coverage</i>	4 (15%)
<i>I don't have insurance</i>	
No need and/or desire to attend	
<i>No one said I needed it. I have a visiting nurse and therapy at home</i>	3 (11%)
<i>Cardiologist said that there was nothing wrong with my heart so I did not need to go</i>	
<i>No need for it</i>	
Hope to attend in the future	3 (11%)
<i>I hope to start in several weeks</i>	
No response	3 (11%)
Issue with transportation and/or distance	
<i>I don't have transportation</i>	2 (7%)
<i>Distance and time is an issue. If they had it closer I would have gone</i>	
Other/Overlapping Concerns	
<i>I need to see my cardiologist first and I need to find transportation</i>	2 (7%)
<i>I don't have a primary care physician</i>	

Table 5**Smoking and Cardiac Rehabilitation**

Do you think your smoking behavior influenced your decision to attend/not attend cardiac rehab?	(n = 62)
Yes	3 (5%)
<i>It's related to the fact that I have to do this and CR makes me feel better. I feel better because of the exercise and I don't feel better when I smoke. CR makes me more likely to stay away from smoking.</i>	
<i>By attending rehab I have the help I need if the sensation to smoke presents itself. Plus the patches have helped me too.</i>	
Yes, I quit smoking so I attended CR	5 (8%)
<i>I quit smoking because of my heart attack but if I didn't quit I would have been less likely to go to CR.</i>	
<i>Due to quitting smoking, I was really interested on seeing how different my breathing would be. And upon doing rehabilitation, I was quite happy with the outcome...</i>	
<i>I quit before I went</i>	
Yes, I attended CR (or wanted to) so I could receive help to quit smoking	5 (8%)
<i>I feel if I exercise regularly that I won't have the urge to smoke. I will not live that life again.</i>	
<i>Attended CR to gain strength and to help quit forever.</i>	
<i>Yes, it had a lot to do with it. If I attended I bet I would have stopped smoking because I was told they would help me.</i>	
No, there was not influence at all	24 (39%)
<i>No, I would have gone even if I was still smoking.</i>	
<i>Didn't influence one way or the other. I knew it was the right thing to do.</i>	
No, I attended for another reason	8 (13%)
<i>No, my doctor told me I had to go to get strong again so I'm going.</i>	
<i>No, I want to go so I can live a few more years.</i>	
<i>No, I needed to go so my heart could get stronger.</i>	
No, I could not attend for another reason	7 (11%)
<i>It's more my work schedule that effects my ability to go. I'm really disappointed in my smoking – maybe CR would help because they'll be bugging me 3 days week.</i>	
<i>It wasn't a factor. I couldn't go to CR either way.</i>	
Other	8 (13%)
<i>I don't know if it did but I think I probably would have been less likely to go had I not quit smoking.</i>	
<i>I need to quit. If I don't then my health will decline. Either way I want to eventually go to CR. Maybe it will help me.</i>	
No response	2 (3%)

CR= cardiac rehabilitation