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Current Smoking as a Marker of a High-Risk Behavioral Profile after Myocardial Infarction

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Abstract

Continued smoking following myocardial infarction (MI) is strongly associated with increased morbidity and mortality. Patients who continue to smoke may also engage in other behaviors that exacerbate risk. This study sought to characterize the risk profile of a national sample of individuals with previous MI who currently smoke. Data were taken from the 2017 Behavioral Risk Factor Surveillance Survey (United States), with 4.2% of the sample reporting a past MI (N=26,004). Participants were classified by smoking status (current/former/never) and compared on medical comorbidities and the clustering of modifiable behaviors relevant for secondary prevention (smoking, poor nutrition, problematic alcohol use, physical inactivity, medication adherence). Current smokers were more likely to report other comorbidities including stroke, chronic obstructive pulmonary disease, physical limitations, and poor mental health. Smokers were also less likely to report taking blood pressure and cholesterol medications, and less likely to attend cardiac rehabilitation (examined in a subset of the sample, N=2,181). Current smoking remained an independent predictor of other health-related behaviors even when controlling for age, sex, race, educational attainment, and other comorbidities. In the modifiable risk-factor behavior cluster analysis, the most common pattern among current smokers was having two risk factors, smoking plus one additional risk factor, whereas the most common pattern was zero risk factors among never or former-smokers. Physical inactivity was the most common additional risk factor across smoking statuses. Current smoking is associated with multiple comorbidities and should be considered a marker for a high-risk behavioral profile among patients with a history of MI.

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Keywords

Smoking; cardiovascular disease; comorbidities; risk factors; health-related behaviors; secondary prevention

Introduction

Heart disease continues to be the number one killer of men and women in the developed world. In the United States, 33% of cardiovascular-related deaths are attributable to cigarette smoking (Centers for Disease Control [CDC], 2008). Unfortunately, 20-26% of people in the US with heart disease report current smoking (Gaalema et al., 2018; Keith et al., 2017; Stanton et al., 2016). National level data suggest that the proportion of people with heart disease who are current smokers is increasing over time (Stanton et al., 2016) and that those with a history of myocardial infarction (MI) are more likely to be current smokers than those without such a history (Gaalema et al., 2018). Continued smoking following an MI is a significant driver of future mortality and morbidity (e.g. Boggon et al., 2014; Chow et al., 2010) and experiencing a major cardiac event, such as an MI, can be a driver of quit intentions and attempts (Riley et al., 2018, 2019), but this experience may not be sufficient to promote successful sustained abstinence (Gaalema et al., 2018).

Negative health outcomes from continued smoking would be compounded in patients who also engaged in other risky health-related behaviors. Health-related behaviors tend to predict other health-related behaviors and research suggests that current smoking is a particularly strong predictor for having the other risky health-related behaviors (Noble et al., 2015; Meader et al., 2016). A number of modifiable health-related behaviors are thought to account for a large amount of the variance in the risk of MI (smoking, physical inactivity, lack of medication adherence, poor nutrition, problematic alcohol consumption; Åkesson et al., 2014; Mok et al., 2018; Notara et al., 2014; Solomon et al., 2020). Accordingly, secondary prevention guidelines suggest intervening on all of these behaviors (Balady et al., 2007) but adherence to recommended behaviors remains low in those with coronary heart disease (Tang et al., 2013). While research has examined adherence to these guidelines in those with MI, how these behaviors cluster in this population, and how smoking predicts these clusters, has not been examined.

Continued smoking after MI is highly predictive of future morbidity and mortality. Patients who smoke and engage in additional unhealthy behavior patterns would have an even higher risk of negative health outcomes. As such, the aims of this paper are to update estimates of current smoking in patients with a history of MI and characterize their health-related behaviors to determine if current smoking is a marker of a multi-risk factor profile.

Methods

Data Source

Data were taken from the 2017 Behavioral Risk Factor Surveillance Survey (BRFSS) (CDC, 2017). The BRFSS is a nationally representative survey conducted annually in conjunction with the Centers for Disease Control and Prevention. BRFSS targets non-institutionalized

adult U.S. residents (18 years or older) and collects prevalence data on chronic health conditions, access to health care, risk behaviors, and preventive health practices using a cross-sectional telephone survey that state health departments conduct monthly over landline and cellular telephones with a standardized questionnaire. For landline surveys, one randomly selected adult within the household is interviewed. For cellular surveys, adults who answer the cellular phone that live in a private residence or college housing are interviewed. During 2017, all 50 states, the District of Columbia, Guam, and Puerto Rico collected BRFSS data. Response rates for BRFSS are calculated using standards set by the American Association for Public Opinion Research (AAPOR) Response Rate Formula #4 (http://www.aapor.org/AAPOR_Main/media/publications/StandardDefinitions20169theditionfinal.pdf). The response rate is the number of respondents who completed the survey as a proportion of all eligible and likely-eligible people. The median survey response rate for all states, territories and Washington, DC, in 2017 was 45.1 and ranged from 30.6 to 64.1. Questions from core modules were asked in all locations. Additionally, there are optional modules that states can choose to ask consistent with their local priorities. In the 2017 data, an optional cardiovascular health module was asked in a subset of states and territories, including the District of Columbia, Puerto Rico, Georgia, Iowa, Ohio, and Tennessee. In this module, respondents who reported in the core modules to having had a heart attack (i.e., MI) in their lifetime were asked additional questions, including whether they attended any outpatient rehabilitation after their MI.

Measures

As part of the core modules, individuals were asked about basic demographics, their smoking status, other medical conditions, and engagement in certain health-related behaviors. Educational attainment was used as a measure of socio-economic status (SES). Educational attainment is an SES measure that is a reliable predictor of health-related behaviors in those with MI (Rosengren et al., 2009). While income data was collected as part of the BRFSS, it was not available for 20% of the sample, making it suboptimal for use in these analyses. To assess potential barriers to accessing care the following question was used “Was there a time in the past 12 months when you needed to see a doctor but could not because of cost?” For medical conditions participants were asked if they had ever been diagnosed with the following in their lifetime: MI, diabetes, stroke, asthma, or chronic obstructive pulmonary disease (COPD). Those who reported lifetime asthma were further asked if they had asthma currently (to differentiate current asthma from juvenile asthma). Smoking status was defined as current (smoked at least 100 lifetime cigarettes and now smoking every day or some days), former (smoked at least 100 lifetime cigarettes and currently not smoking), or never (had not smoked at least 100 lifetime cigarettes). Medication adherence for the most commonly prescribed cardiac-related medications (current use of blood pressure and cholesterol medications) was defined as those responding “yes” to currently taking the medication, within those who reported having them prescribed. Mental health was examined using the question, “Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?” For the other health-related behaviors, having a risky pattern of behavior was defined as reporting: consuming < 1 vegetable daily; problematic alcohol consumption (for men, drinking >14 drinks per week; for women,

drinking >7 drinks per week); and engaging in zero minutes of physical activity during a week. These cut-offs were drawn from precalculated variables in the BRFSS and are consistent with cut-offs used in prior research examining clustering of negative health-related behaviors and examinations of post-MI behavior (e.g. Chiolero et al., 2006, Mok et al., 2018).

Within those who were asked the optional cardiovascular health module (8% of those with MI in the overall sample), cardiac rehabilitation (CR) attendance was queried by asking, "Following your heart attack, did you go to any kind of outpatient rehabilitation? This is sometimes called 'rehab.'" CR generally occurs within a year of MI and thus this behavior is potentially a behavior that could have occurred years previous and is distinct from the other "current" behaviors examined in this report. The question asked also does not differentiate CR from other rehabilitation that may have been attended, and is likely an overestimation of actual CR attendance.

Post-MI patients were classified by smoking status (current/former/never) and compared on comorbidities (history of stroke, diabetes, COPD, current asthma, physical difficulties, and number of poor mental health days), health-related behaviors (use of prescribed blood pressure or cholesterol medicine, physical inactivity, low vegetable consumption, and problematic alcohol consumption), and attendance at CR.

Statistical Methods

Frequencies and cross-tabulations between groups were generated using PROC SURVEYFREQ in SAS 9.4 (SAS Institute, Cary, NC), including individual weights (_llcpwt), strata (_ststr), and cluster (_psu) in all analyses. To examine predictors of risk factor clusters, total number of risk factors was calculated for each person out of a possible five (current smoking, zero physical activity, <1 vegetable daily, heavy alcohol consumption, medication non-adherence). Groups of risk factors (0, 1, 2, 3+) were compared on demographics and mental health status.

To examine the independent contribution of smoking status to health-related behaviors, we used logistic regressions with prescribed blood pressure or cholesterol medicine, physical activity, vegetable consumption, problematic alcohol consumption, and CR attendance as outcomes, controlling for age, sex, race, educational attainment, mental health, fitness difficulties, and having had stroke, diabetes, or COPD.

Cluster analyses of four behavioral risk factors (current smoking, zero physical activity, <1 vegetable daily, heavy alcohol consumption) were conducted using two different methods of calculating distance (DGower and Euclidean distance) and two different methods of clustering (Ward's minimum-variance method and average linkage) (Rencher & Christensen, 2012). The entire sample of post-MI patients was randomly split in half, and the four methods of clustering (two distance methods by two clustering methods) were used with each half, followed by an examination of consistency in results. This procedure was replicated using the subset of people who had reported being prescribed either cholesterol or blood pressure medication. For this analysis, medication adherence was included as a fifth behavior. Non-adherence was defined as not using all prescribed medications (not using one

if one was prescribed, or not using at least one if both were prescribed). PROC DISTANCE and PROC CLUSTER were used to conduct these analyses.

Results

The parent sample included 450,016 US adults. Of this sample, 15.5% (95% CI: 15.3, 15.7) reported smoking on some or all days. Of the parent sample, 4.2% (n = 25,002) reported having been diagnosed with an MI in their lifetime. Those who reported having had an MI in their lifetime were the basis for all of the following analyses. Current smoking was higher in those with lifetime-MI (22.3% [95% CI: 21.1, 23.5] vs. 15.2% [95% CI: 14.9, 15.4]). Table 1 contains demographic information of participants who reported a history of MI separated by smoking status (current vs. former vs. never). Current smokers tended to be younger, with less educational attainment, and were more likely to report not accessing needed health care due to cost.

Differences in medical comorbidities by smoking status are shown in Table 2. Among those with lifetime-MI, individuals reporting current smoking were also more likely to report other medical comorbidities including stroke, COPD, current asthma, difficulty walking or climbing stairs, and more poor mental health days in the past month compared to never or former smokers. However, reports of high cholesterol or high blood pressure were similar across smoking statuses and current smokers were less likely to report having diabetes as compared to never or former smokers.

Behavioral risk factors by smoking status are shown in Table 3. A sizable proportion of the sample were eating less than one vegetable per day (19.2-22.0%) or engaging in zero minutes of physical activity per week (37.3-47.0%). Of those who reported being told they had high cholesterol/ high blood pressure, current smokers were less likely to report taking blood pressure and cholesterol medications. Current smokers also reported engaging in less physical activity, and were more likely to engage in problematic alcohol consumption.

Within those with lifetime-MI, 8% (N=2181) were in a state/territory that used the optional cardiac module and were queried about CR attendance. In this subsample, current smokers were less likely to report attending at least some rehabilitation following their MI as compared to either never or former smokers (Table 3).

Health-related behaviors are also influenced by sociodemographics and comorbidities, so the independent effect of smoking status on health-related behaviors was examined using multiple logistic regression (Table 4). Current smoking was a significant independent predictor of all behaviors examined, compared both to never and to former smokers, even when controlling for age, sex, race, educational attainment, mental health status, and other comorbidities.

In the risk-factor clustering analyses there were no differences in outcomes based on the type of methodologies used (Ward's minimum-variance method and average linkage) or by which of the two halves of the sample were examined. Regardless of the approach, clustering of risk factors remained the same. The number and types of risk behaviors that were most commonly observed together among current smokers, former smokers, and never

smokers can be seen in Table 5. The ranking of risk factors was the same across the three smoking categories. The most common additional risk factor was no physical activity followed by the combination of no physical activity and < 1 vegetable per day. The most striking difference between the smoking categories is in the percent of people in the zero additional risk factors cluster (37.5% in the current smokers vs. 49.2/47.4% in the never/former smokers). Examined by number of additional risk factors (last column, Table 5), the most common pattern for current smokers (45.9% of total clusters) is to have 1 additional risk factor, and thus 2 risk factors overall (i.e., one other risk factor plus smoking) while the most common pattern for never/former-smokers (49.2 and 47.4% respectively) is to have 0 additional risk factors, and thus 0 risk factors overall.

The analyses including medication adherence can be seen in Table 6. The pattern of risk factors is very similar to the analyses without medication adherence, with the three highest ranking clusters for each group being no additional risk factors, followed by no physical activity alone and no physical activity combined with less than one vegetable per day. Interestingly the most common presentation of medication non-adherence for each group is in a cluster with no other risk factors.

Demographics associated with clustering of risk factors can be seen in Table 7. Higher numbers of risk factors are associated with younger age, lower educational attainment, and worse mental health.

Discussion

Current smoking continues to be highly prevalent in cardiac populations with 22.5% of people with lifetime-MI in the present study reporting smoking on some or all days. This is consistent with other recent reports estimating rates of 20-26% (Gaalema et al., 2018; Keith et al., 2017; Stanton et al., 2016). There are evidence-based treatments that increase abstinence rates in this population, including pharmacotherapy such as varenicline, bupropion and nicotine replacement therapy (Eisenberg et al., 2010) which suggests that these treatments are not being delivered or that more efficacious interventions should be developed (Pack et al., 2017; Rigotti et al., 2010).

The current analyses suggest that smoking is not the only challenge these patients face. While the data does not allow us to examine the time since the MI has occurred, we can examine how these high-risk patients are currently behaving. In the cluster analyses, those who smoke are also likely to have at least one additional behavioral risk factor, whereas those who do not smoke are most likely to have no behavioral risk factors. Additionally, within those who smoke, the most common additional risk factor was no physical activity, contained in over half of the risk factor clusters. Those who increase or maintain physical activity following MI have mortality HR of 0.29-0.41 as compared to those who continue to be inactive (Ekblom et al., 2018) while quitting smoking following MI is associated with a RR in all-cause mortality of 0.64 (Critchley & Capewell, 2003). Accordingly, this combination of inactivity and continued smoking in people with a history of MI is very concerning.

The cluster analysis including medication adherence also provided interesting insights. Medication non-adherence were relatively low compared to the other behaviors (13-20% of clusters) and the most common clusters including medication adherence, across smoking statuses, had only medication adherence as a risk factor (about 8% of clusters overall). This suggests that medication adherence should be queried for all patients, independent of other risk factors.

Given these multiple risk factors, patients who smoke should be a focus for secondary prevention efforts. One option is to improve attendance at CR, a comprehensive program focused on management of modifiable risk factors in cardiac patients. Importantly, CR is structured to address many of these risk factors including smoking cessation, physical activity and medication compliance (Ades, 2001) and participation at CR is associated with reductions in morbidity and mortality (Heran et al., 2011) and patients who participate in CR report improvements in exercise capacity, quality of life, and mental health (Puetz, et al., 2006; Gellis et al., 2012). Unfortunately, cardiac patients who smoke (i.e., those who could benefit the most from secondary prevention) are also less likely to attend CR, as seen in the current data, and consistent with previous findings (Gaalema et al., 2015; 2017).

However, CR is generally only available in the year following a cardiac event and CR programs may vary in their ability to address certain risk factors, such as smoking, hyperlipidemia, obesity, and type 2 Diabetes. Accordingly, targeted secondary prevention needs to take place in other outpatient settings, such as in the practices of cardiologists and primary care physicians. The results from this study show that these risky health-related behaviors cluster, such that clinicians should be prepared to intervene on multiple behaviors. Additionally, higher number of risk factors are associated with younger age, lower educational attainment, and poor mental health, allowing for potential identification of those who could need the most assistance. Given the importance of smoking cessation in this population, clinicians should be familiar with current suggested guidelines for cessation (Barua et al., 2018) and know which cessation programs are available in their area. Additionally, with the high levels of inactivity in this population, and the associated negative health effects, clinicians should be prepared to assess cardiorespiratory fitness and encourage regular exercise (Ross et al., 2016). Nutrition should also be addressed; clinics should consider having a dietician on staff or have one identified for referrals. Finally, given the strong association between these risk behaviors and mental health, clinicians should, at minimum, have knowledge of locally available mental health services. Ideally, however, mental health treatment would be better integrated into physical health systems. Given the interrelatedness of mental and physical health, having mental health providers present in clinics should reduce patient burden while also improving health outcomes (e.g. Leung et al., 2018). This integration of care seems particularly appropriate for cardiac rehabilitation clinics, who generally already offer multi-disciplinary care, and where associations between mental and physical health are particularly strong (Pogosova et al., 2015).

Several limitations of the current study merit mention. First, smoking status, comorbidities, and health-related behaviors were all self-reported. Second, MI was queried as lifetime MI, so length of time between MI and current smoking could not be determined. Third, those who answered the CR question were not a nationally representative sample and detailed

examinations of demographic predictors of CR could not be calculated given the relatively limited number of states who chose to use the associated module. Fourth, attendance at CR was asked as had the patient attended “any kind of” rehabilitation following their MI. This may have led to an inflated rate of reported attendance as patients may have mistakenly reported use of other rehabilitative care following MI as CR. Fifth, response rates varied by state and the BRFSS uses a national level weighting adjustment which could introduce bias as the weighted distributions of the state samples do not always adhere to national demographic distributions. However, despite these limitations, this study provides data from a very large, nationally representative survey that informs clinicians that current smoking in a patient with lifetime-MI is a marker of having other health-related risk factors.

Conclusions

Over 20% of patients with a history of MI are current smokers despite the known detrimental health effects of smoking in this population. Current smoking is a marker of a high-risk profile with a higher likelihood of having co-morbidities such as COPD, asthma, history of stroke, physical limitations, and mental health challenges. This high-risk clinical profile is further complicated by a high-risk behavioral profile as seen by a decreased likelihood of taking prescribed medications as well as characterized by a likelihood of engaging in multiple unhealthy behaviors as seen in the cluster analysis. Unfortunately, these high-risk patients are also less likely to engage in secondary prevention. Interventions are needed to keep those who smoke engaged in treatment and more needs to be done to improve treatments for targeting multiple risk factors. Clinicians should be aware that current smoking is a marker for a high-risk profile within patients with a past MI.

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References

- Ades PA. Cardiac rehabilitation and secondary prevention of coronary heart disease. *N Engl J Med*. 2001; 345: 892–902. doi: 10.1056/NEJMra001529 [PubMed: 11565523]
- Åkesson A, Larsson SC, Discacciati A, Wolk A. Low-risk diet and lifestyle habits in the primary prevention of myocardial infarction in men: a population-based prospective cohort study. *J Am Coll Cardiol*. 2014 9 30;64(13):1299–306. [PubMed: 25257629]
- Balady GJ, Williams MA, Ades PA, Bittner V, Comoss P, Foody JM, Franklin B, Sanderson B, Southard D. Core components of cardiac rehabilitation/secondary prevention programs: 2007 update: A scientific statement from the american heart association exercise, cardiac rehabilitation, and prevention committee, the council on clinical cardiology; the councils on cardiovascular nursing, epidemiology and prevention, and nutrition, physical activity, and metabolism; and the American Association of Cardiovascular and Pulmonary Rehabilitation. *Circulation*. 2007 5 22;115(20):2675–82. [PubMed: 17513578]
- Barua RS, Rigotti NA, Benowitz NL, Cummings KM, Jazayeri MA, Morris PB, Ratchford EV, Sarna L, Stecker EC, Wiggins BS. 2018 ACC expert consensus decision pathway on tobacco cessation treatment: a report of the American College of Cardiology Task Force on Clinical Expert Consensus Documents. *J Am Coll Cardiol*. 2018 12 17;72(25):3332–65. [PubMed: 30527452]

- Boggon R, Timmis A, Hemingway H, Raju S, Malvestiti FM, Van Staa TP. Smoking cessation interventions following acute coronary syndrome: a missed opportunity? *Eur J Prev Cardiol.* 2014;21(6): 767–773. doi: 10.1177/2047487312460517 [PubMed: 22952289]
- Centers for Disease Control and Prevention (CDC). Smoking-attributable mortality, years of potential life lost, and productivity losses—United States, 2000–2004. *MMWR Morb Mortal Wkly Rep.* 2008; 57: 1226–8. [PubMed: 19008791]
- Centers for Disease Control and Prevention (CDC). Behavioral Risk Factor Surveillance System Survey Data. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2017 <https://www.cdc.gov/brfss/>. Accessed November 13th, 2019.
- Chiolero A, Wietlisbach V, Ruffieux C, Paccaud F, Cornuz J. Clustering of risk behaviors with cigarette consumption: a population-based survey. *Prev Med.* 2006 51;42(5):348–53. [PubMed: 16504277]
- Chow CK, Jolly S, Rao-Melacini P, Fox KA, Anand SS, Yusuf S. Association of diet, exercise, and smoking modification with risk of early cardiovascular events after acute coronary syndromes. *Circ.* 2010;121(6): 750–758. doi: 10.1161/CIRCULATIONAHA.109.891523.
- Critchley JA, Capewell S. Smoking cessation for the secondary prevention of coronary heart disease. *Cochrane Database Syst Rev.* 2003(4).
- Eisenberg MJ, Blum LM, Filion KB, et al. The efficacy of smoking cessation therapies in cardiac patients: a meta-analysis of randomized controlled trials. *Can J Cardiol.* 2010;26(2):73–9. doi: 10.1016/s0828-282x(10)70002-7 [PubMed: 20151052]
- Eklblom O, Ek A, Cider Å, Hambraeus K, Börjesson M. Increased physical activity post-myocardial infarction is related to reduced mortality: results From the SWEDEHEART Registry. *J Am Heart Assoc.* 2018 12 18;7(24):e010108. info:doi/10.1161/JAHA.118.010108 [PubMed: 30561263]
- Gaalema DE, Pericot-Valverde I, Bunn JY, et al. Tobacco use in cardiac patients: Perceptions, use, and changes after a recent myocardial infarction among US adults in the PATH Study (2013–2015). *Prev Med.* 2018;117:76–82. doi: 10.1016/j.ypmed.2018.05.004 [PubMed: 29746974]
- Gaalema DE, Cutler AY, Higgins ST, Ades PA. Smoking and cardiac rehabilitation participation: associations with referral, attendance and adherence. *Prev Med.* 2015;80:67–74. doi: 10.1016/j.ypmed.2015.04.009 [PubMed: 25900804]
- Gaalema DE, Savage PD, Rengo JL, et al., Patient characteristics predictive of cardiac rehabilitation adherence. *J Cardiopulm Rehabil Prev.* 2017;37:103–110. doi: 10.1097/HCR.0000000000000225 [PubMed: 28033166]
- Gellis ZD, Kang-Yi C. Meta-analysis of the effect of cardiac rehabilitation interventions on depression outcomes in adults 64 years of age and older. *Am J Cardiol.* 2012;110:1219–1224. doi: 10.1016/j.amjcard.2012.06.021 [PubMed: 22835411]
- Heran BS, Chen JM, Ebrahim S, et al. Exercise-based cardiac rehabilitation for coronary heart disease. *Cochrane Database Syst Rev.* 2011; 7: CD001800. doi: 10.1002/14651858.CD001800.pub2.
- Keith DR, Stanton CA, Gaalema DE, et al. Disparities in US healthcare provider screening and advice for Cessation across chronic medical conditions and tobacco products. *J Gen Intern Med.* 2017;32(9):974–980. doi: 10.1007/s11606-017-4062-6 [PubMed: 28470547]
- Leung LB, Yoon J, Rubenstein LV, et al. Changing Patterns of Mental Health Care Use: The Role of Integrated Mental Health Services in Veteran Affairs Primary Care. *J Am Board Fam Med.* 2018;31(1):38–48. doi:10.3122/jabfm.2018.01.170157 [PubMed: 29330238]
- Meador N, King K, Moe-Byrne T, et al. A systematic review on the clustering and co-occurrence of multiple risk behaviours. *BMC Public Health.* 2016; 16(1): 657–666. doi:10.1186/s12889-016-3373-6 [PubMed: 27473458]
- Mok Y, Sang Y, Ballew SH, Rebholz CM, Rosamond WD, Heiss G, Folsom AR, Coresh J, Matsushita K. American Heart Association's Life's Simple 7 at middle age and prognosis after myocardial infarction in later life. *J Am Heart Assoc.* 2018 2 17;7(4):e007658. [PubMed: 29455158]
- Noble N, Paul C, Turon H, Oldmeadow C. Which modifiable health risk behaviours are related? A systematic review of the clustering of Smoking, Nutrition, Alcohol and Physical activity ('SNAP') health risk factors. *Prev Med.* 2015; 81: 16–41. doi: 10.1016/j.ypmed.2015.07.003 [PubMed: 26190368]

- Notara V, Panagiostakos DB, Pitsavos CE. Secondary prevention of acute coronary syndrome. Socioeconomic and lifestyle determinants: a literature review. *Central Eur J of Public Health*. 2014 9 1;22(3):175.
- Pack QR, Priya A, Lagu TC, Pekow PS, Rigotti NA, Lindenauer PK. Smoking cessation pharmacotherapy among smokers hospitalized for coronary heart disease. *JAMA Intern Med*. 2017;177: 1525–1527. doi: 10.1001/jamainternmed.2017.3489. [PubMed: 28828485]
- Pogosova N, Saner H, Pedersen SS, et al. Psychosocial aspects in cardiac rehabilitation: From theory to practice. A position paper from the Cardiac Rehabilitation Section of the European Association of Cardiovascular Prevention and Rehabilitation of the European Society of Cardiology. *Eur J Prev Cardiol*. 2015;22:1290–306. doi: 10.1177/2047487314543075. [PubMed: 25059929]
- Puetz TW, Beasman KM, O'Connor PJ. The effect of cardiac rehabilitation exercise programs on feelings of energy and fatigue: A meta-analysis of research from 1945 to 2005. *Eur J Cardiovasc Prev Rehabil*. 2006;13:886–893. doi: 10.1097/01.hjr.0000230102.55653.0b [PubMed: 17143119]
- Rencher AC, Christensen WF. *Methods of Multivariate Analysis*. 3rd ed. New York, NY: John Wiley & Sons; 2012.
- Riley H, Headley S, Winter C, et al. (2018). Effect of smoking status on exercise perception and intentions for cardiac rehabilitation enrollment among patients hospitalized with an acute cardiac condition. *J Cardiopulm Rehabil Prev*. 2018; 38: 286–290. doi: 10.1097/HCR.0000000000000288. [PubMed: 29120970]
- Riley H, Ainani N, Turk A, et al. Smoking cessation after hospitalization for myocardial infarction or cardiac surgery: Assessing patient interest, confidence, and physician prescribing practices. *Clin Cardiol*. 2019; 42: 1189–1194. doi:10.1002/clc.23272 [PubMed: 31647127]
- Rigotti NA, Pipe AL, Benowitz NL, Arteaga C, Garza D, Tonstad S. Efficacy and safety of varenicline for smoking cessation in patients with cardiovascular disease: a randomized trial. *Circ*. 2010;121:221–9. doi: 10.1161/CIRCULATIONAHA.109.869008
- Ross R, Blair SN, Arena R, Church TS, Després JP, Franklin BA, Haskell WL, Kaminsky LA, Levine BD, Lavie CJ, Myers J. Importance of assessing cardiorespiratory fitness in clinical practice: a case for fitness as a clinical vital sign: a scientific statement from the American Heart Association. *Circ*. 2016 12 13;134(24):e653–99.
- Rosengren A, Subramanian SV, Islam S, et al. Education and risk for acute myocardial infarction in 52 high, middle and low-income countries: INTERHEART case-control study. *Heart*. 2009;95:2014–2022. [PubMed: 19822574]
- Solomon MD, Leong TK, Levin E, Rana JS, Jaffe MG, Sidney S, Sung SH, Lee C, DeMaria A, Go AS. Cumulative Adherence to Secondary Prevention Guidelines and Mortality After Acute Myocardial Infarction. *J Am Heart Assoc*. 2020 3 17;9(6):e014415. [PubMed: 32131689]
- Stanton CA, Keith DR, Gaalema DE, et al. Trends in tobacco use among US adults with chronic health conditions: National Survey on Drug Use and Health 2005–2013. *Prev Med*. 2016;92:160–168. doi:10.1016/j.ypmed.2016.04.008 [PubMed: 27090919]
- Tang L, Patao C, Chuang J, Wong ND. Cardiovascular risk factor control and adherence to recommended lifestyle and medical therapies in persons with coronary heart disease (from the National Health and Nutrition Examination Survey 2007–2010). *Am J Cardiol*. 2013 10 15;112(8):1126–32. [PubMed: 23827404]

Highlights

- Many patients continue to smoke after having a myocardial infarction (MI).
- People who smoke after an MI also have other adverse cardiac risk factors
- People who smoke after MI likely need to change multiple unhealthy behaviors.

Table 1.

Sociodemographic characteristics among respondents who experienced a lifetime myocardial infarction by smoking status. BRFSS, United States, 2017.

	Never Smoker (n = 9,088)		Former Smoker (n = 10,932)		Current Smoker (n = 4,982)	
	Unweighted sample size n	Weighted % (95% CI)	Unweighted sample size n	Weighted % (95% CI)	Unweighted sample size n	Weighted % (95% CI)
Age (years)						
18-24	42	1.3 (0.7, 1.8)	13	0.1 (0.03, 0.3)	28	1.3 (0.6, 2.1)
25-34	105	2.1 (1.5, 2.7)	46	1.3 (0.7, 2.0)	98	3.6 (2.5, 4.6)
35-44	238	6.3 (4.7, 7.9)	161	3.4 (2.2, 4.5)	275	10.1 (7.5, 12.7)
45-54	736	12.9 (11.3, 14.5)	618	8.3 (7.2, 9.5)	861	23.1 (20.3, 25.9)
55-64	1,788	21.6 (19.8, 23.4)	2,079	22.1 (20.4, 23.8)	1,786	35.7 (32.6, 38.8)
65 or older	6,179	55.8 (53.5, 58.1)	8,015	64.6 (62.6, 66.7)	1,934	26.1 (23.7, 28.6)
Sex						
Female	4,604	46.3 (44.0, 48.6)	3,688	31.0 (29.2, 32.8)	2,084	38.6 (35.4, 41.8)
Male	4,480	53.5 (51.2, 55.8)	7,238	69.0 (67.1, 70.8)	2,892	60.8 (57.5, 64.1)
Race/ethnicity						
White, Non-Hispanic	7,079	64.5 (62.2, 66.8)	9,207	79.1 (77.2, 80.9)	3,757	70.4 (67.1, 73.7)
Black, Non-Hispanic	782	12.6 (11.0, 14.2)	626	7.5 (6.5, 8.4)	428	13.9 (11.1, 16.7)
Asian, Non-Hispanic	113	3.8 (2.3, 5.3)	72	0.8 (0.3, 1.3)	22	1.5 (0.2, 2.9)
American Indian/Alaskan Native	188	1.2 (0.9, 1.6)	247	1.4 (1.0, 1.9)	291	2.9 (2.2, 3.7)
Hispanic	675	15.8 (13.9, 17.7)	430	8.9 (7.3, 10.4)	228	8.5 (6.3, 10.7)
Other, Non-Hispanic	251	2.0 (1.4, 2.7)	350	2.3 (1.8, 2.8)	256	2.8 (2.2, 3.3)
Education						
No school/only kindergarten	26	0.4 (0.2, 0.7)	13	0.2 (0.04, 0.4)	12	0.3 (0.04, 0.6)
Grades 1 through 8	400	8.7 (7.1, 10.3)	414	7.3 (5.9, 8.7)	260	8.2 (6.5, 9.9)
Grades 9 through 11	554	11.6 (9.9, 13.4)	845	13.4 (11.8, 15.1)	706	24.8 (21.5, 28.0)
High school graduate	2,850	30.4 (28.3, 32.5)	3,686	31.3 (29.6, 33.0)	1,817	30.7 (28.0, 33.3)
College 1 to 3 years	2,419	27.3 (25.3, 29.3)	3,186	31.4 (29.5, 33.3)	1,521	28.8 (25.7, 31.8)
College graduate	2,817	21.3 (19.6, 23.0)	2,758	16.0 (14.7, 17.2)	653	7.0 (6.0, 8.0)
Health care cost prohibitive (yes)	1,051	16.2 (14.4, 18.1)	1,105	11.6 (10.4, 12.9)	1,142	26.7 (23.5, 30.0)

Note. 95% CI = 95% confidence interval.

Table 2.

Medical Co-Morbidities by Smoking Status Among Post-MI Patients. BRFSS, United States, 2017.

	Never Smoker (n = 9,088)		Former Smoker (n = 10,932)		Current Smoker (n = 4,982)	
	Unweighted n	Weighted % (95% CI)	Unweighted n	Weighted % (95% CI)	Unweighted n	Weighted % (95% CI)
Ever stroke						
Yes	1,753	18.8 (17.1, 20.6)	2,005	18.8 (17.2, 20.5)	1,143	23.2 (20.3, 26.1)
No	7,255	80.5 (78.7, 82.2)	8,830	80.4 (78.7, 82.1)	3,778	75.5 (72.5, 78.4)
DK/U/Refused	80	0.7 (0.4, 1.0)	97	0.8 (0.5, 1.0)	61	1.3 (0.6, 2.0)
Diabetes						
Yes	3,132	34.0 (31.8, 36.2)	3,923	37.0 (35.0, 39.0)	1,462	28.4 (25.4, 31.5)
Yes, female only when pregnant	29	0.3 (0.1, 0.5)	19	0.2 (0.1, 0.3)	27	0.5 (0.2, 0.9)
No	5,670	61.6 (59.3, 63.9)	6,666	58.1 (56.0, 60.1)	3,311	67.3 (64.2, 70.5)
No, pre-diabetes or borderline diabetes	246	4.0 (2.9, 5.0)	303	4.2 (2.9, 5.5)	163	3.3 (2.1, 4.4)
DK/U/Refused	11	0.1 (0.01, 0.1)	21	0.5 (0.2, 0.9)	19	0.4 (0.1, 0.7)
COPD						
Yes	1,181	12.5 (11.2, 13.8)	3,030	27.2 (25.5, 28.9)	2,101	39.1 (36.0, 42.1)
No	7,805	86.3 (84.8, 87.7)	7,793	71.8 (70.0, 73.5)	2,812	59.7 (56.6, 62.8)
DK/U/Refused	102	1.2 (0.6, 1.8)	109	1.0 (0.7, 1.3)	69	1.2 (0.4, 2.0)
Current asthma						
Yes	1,197	74.0 (70.0, 77.9)	1,466	76.9 (73.3, 80.6)	990	86.4 (83.5, 89.3)
No	411	24.4 (20.5, 28.3)	421	21.1 (17.5, 24.6)	174	11.3 (8.7, 14.0)
DK/U/Refused	29	1.6 (0.6, 2.6)	52	2.0 (1.0, 2.9)	34	2.3 (1.2, 3.3)
Told high blood cholesterol						
Yes	5,563	61.2 (58.9, 63.5)	7,381	67.9 (65.9, 69.9)	3,205	65.3 (62.1, 68.5)
No	3,286	37.3 (35.0, 39.5)	3,292	31.1 (29.2, 33.1)	1,544	33.2 (30.1, 36.4)
DK/U/Refused	102	1.5 (0.5, 2.6)	121	0.9 (0.7, 1.2)	81	1.5 (0.9, 2.1)
Told high blood pressure						
Yes	6,647	72.2 (70.1, 74.3)	8,217	74.5 (72.7, 76.4)	3,569	72.9 (70.3, 75.5)
Yes, but female told only during pregnancy	39	0.5 (0.1, 0.9)	25	0.4 (0.1, 0.7)	15	0.3 (0.1, 0.5)
No	2,306	26.1 (24.0, 28.2)	2,582	24.0 (22.2, 25.8)	1,364	25.9 (23.3, 28.4)
Told borderline high or pre-hypertensive	57	0.6 (0.2, 0.9)	59	0.4 (0.2, 0.5)	20	0.7 (0.0, 1.5)
DK/U/Refused	39	0.6 (0.1, 1.1)	49	0.6 (0.1, 1.2)	14	0.2 (0.1, 0.3)
Difficulty walking or climbing stairs						
Yes	3,611	39.3 (37.0, 41.6)	4,673	42.8 (40.8, 44.7)	2,644	52.9 (49.7, 56.1)
No	5,414	59.9 (57.6, 62.2)	6,207	56.8 (54.9, 58.8)	2,311	46.5 (43.4, 49.7)
DK/U/Refused	63	0.7 (0.4, 1.1)	52	0.4 (0.2, 0.5)	27	0.6 (0.2, 0.9)
Past-month poor mental health days						
0 days	6,114	63.6 (61.3, 65.8)	7,428	66.4 (64.5, 68.2)	2,399	45.0 (41.7, 48.3)
1-13 days	1,557	19.2 (17.2, 21.2)	1,719	15.4 (14.1, 16.8)	985	21.0 (18.5, 23.5)

	Never Smoker (n = 9,088)		Former Smoker (n = 10,932)		Current Smoker (n = 4,982)	
	Unweighted n	Weighted % (95% CI)	Unweighted n	Weighted % (95% CI)	Unweighted n	Weighted % (95% CI)
14+ days	1,202	15.1 (13.6, 16.7)	1,554	16.2 (14.7, 17.7)	1,474	31.2 (28.3, 34.0)
DK/Refuse/Missing	215	2.1 (1.5, 2.6)	231	2.0 (1.6, 2.4)	124	2.8 (1.4, 4.2)

Note. 95% CI = 95% confidence interval. DK = Don't know. U = Unsure. COPD = Chronic obstructive pulmonary disease.

Table 3.

Behavioral Risk Factors Among Post-MI Patients by Smoking Status. BRFSS, United States, 2017.

	Never Smoker (n = 9,088)		Former Smoker (n = 10,932)		Current Smoker (n = 4,982)	
	Unweighted n	Weighted % (95% CI)	Unweighted n	Weighted % (95% CI)	Unweighted n	Weighted % (95% CI)
Taking prescribed cholesterol medicine						
Yes	4,687	83.3 (81.0, 85.6)	6,388	86.2 (84.7, 87.8)	2,515	75.5 (72.1, 78.9)
No	844	16.3 (14.0, 18.5)	937	13.1 (11.6, 14.6)	672	24.0 (20.7, 27.4)
DK/U/Refused	32	0.4 (0.2, 0.7)	56	0.6 (0.3, 0.9)	18	0.5 (0.1, 0.9)
Taking prescribed blood pressure medicine						
Yes	6,087	91.3 (89.8, 92.8)	7,617	92.2 (91.0, 93.5)	3,087	84.0 (81.1, 86.9)
No	547	8.5 (7.0, 10.1)	581	7.6 (6.4, 8.9)	470	15.9 (13.0, 18.8)
DK/U/Refused	13	0.2 (0.02, 0.3)	19	0.1 (0.02, 0.2)	12	0.1 (0.02, 0.2)
Weekly physical activity minutes						
150+	3,840	40.8 (38.5, 43.1)	4,589	40.5 (38.6, 42.4)	1,621	33.3 (30.1, 36.5)
1-149	1,068	11.9 (10.5, 13.4)	1,212	11.4 (10.1, 12.6)	574	10.0 (8.6, 11.4)
0	3,394	37.3 (35.1, 39.6)	4,320	40.2 (38.2, 42.2)	2,384	47.0 (43.8, 50.2)
DK/U/Refused	786	9.9 (8.2, 11.6)	811	8.0 (6.8, 9.2)	403	9.7 (7.7, 11.7)
Consume vegetables at least 1 time/day						
Yes	6,642	70.1 (67.9, 72.4)	8,156	72.2 (70.4, 74.1)	3,440	68.1 (65.1, 71.1)
No	1,594	19.3 (17.4, 21.2)	1,866	19.2 (17.5, 20.9)	1,090	22.0 (19.3, 24.7)
DK/Refused/Miss	852	10.6 (8.9, 12.3)	910	8.6 (7.6, 9.6)	452	9.9 (8.1, 11.7)
Heavy alcohol consumption						
Yes	166	1.6 (1.2, 2.1)	382	3.7 (2.9, 4.5)	344	8.2 (6.3, 10.0)
No	8,661	94.5 (93.2, 95.8)	10,249	93.3 (92.3, 94.4)	4,430	85.5 (82.9, 88.0)
DK/U/Refused	261	3.8 (2.6, 5.1)	301	3.0 (2.3, 3.7)	208	6.3 (4.4, 8.3)
Attended outpatient CR						
Yes	375	43.1 (38.0, 48.2)	416	45.8 (40.9, 50.7)	164	31.6 (25.5, 37.8)
No	448	54.4 (49.4, 59.5)	426	52.7 (47.8, 57.6)	289	65.9 (59.5, 72.3)
DK/U/Refused	23	2.5 (1.1, 3.9)	13	1.5 (0.3, 2.7)	12	2.5 (0.0, 5.0)

Note. 95% CI = 95% confidence interval. DK = Don't know. U = Unsure. Heavy alcohol consumption was calculated by the BRFSS as men who drink more than 14 alcoholic drinks per week and women who drink more than 7 alcoholic drinks per week. Outpatient CR attendance was asked in the District of Columbia, Georgia, Iowa, Ohio, Puerto Rico, and Tennessee (n = 2,181).

Table 4.

Odds Ratios of Unhealthy Behaviors by Current vs. Never and Former Smokers, BRFSS, United States, 2017.

	<i>n</i>	OR	95% CI
Current vs. Never Smokers			
Not taking cholesterol med	16,043	1.24	(1.10, 1.41)
Not taking blood pressure med	18,389	1.28	(1.10, 1.48)
Problematic drinking	24,232	3.66	(2.98, 4.49)
Zero minutes physical activity	23,002	1.25	(1.15, 1.35)
Not eating at least one veg daily	22,788	1.12	(1.02, 1.23)
Not attending outpatient CR	2,118	1.51	(1.16, 1.97)
Current vs. Former Smokers			
Not taking cholesterol med	16,043	1.37	(1.22, 1.55)
Not taking blood pressure med	18,389	1.39	(1.21, 1.60)
Problematic drinking	24,232	1.77	(1.50, 2.09)
Zero minutes physical activity	23,002	1.23	(1.14, 1.33)
Not eating at least one veg daily	22,788	1.25	(1.14, 1.37)
Not attending outpatient CR	2,118	1.55	(1.20, 2.00)

Note. OR = Odds ratio. 95% CI = 95% confidence interval. Analyses controlled for age, sex, race, educational attainment, and comorbidities (stroke, diabetes, COPD, difficulty walking/climbing stairs, and past month mental health status).

Table 5.

Cluster Analysis Examining Grouping of Health-Related Behaviors by Smoking Status, BRFSS, United States, 2017.

	Problematic Drinking	No Physical Activity	Less than One Vegetable/Day	Cluster Frequency	Additional Risk Factors
Never-Smokers (n=7,749)				49.2%	0
		X		29.7%	1
		X	X	10.4%	2
			X	8.8%	1
	X			1.1%	1
	X	X		0.4%	2
Former Smokers (n=9,493)				47.4%	0
		X		31.3%	1
		X	X	8.9%	2
			X	8.7%	1
	X			1.9%	1
	X	X		1.2%	2
Current Smokers (n=4,269)				37.5%	0
		X		34.3%	1
		X	X	12.4%	2
			X	8.7%	1
	X			3.0%	1
	X	X		2.8%	2

Note. Cluster analyses were conducted using two different methods of calculating distance (DGower and Euclidean distance) and two different methods of clustering (Ward's minimum-variance method and average linkage) (Rencher & Christensen, 2012). The entire sample of post-MI patients was randomly split in half and the four methods of clustering (two distance methods by two clustering methods) were used with each half followed by an examination of consistency in results.

Table 6.

Cluster Analysis Examining Grouping of Health-Related Behaviors Including Medication Non-Adherence by Smoking Status, BRFSS, United States, 2017.

	Problematic Drinking	No Physical Activity	Less than One Vegetable/Day	Non-Adherence Medication	Cluster Frequency	Additional Risk Factors
Never-Smokers (<i>n</i> =6,576)					40.4%	0
	X				26.6%	1
	X	X			8.7%	2
				X	7.4%	1
		X			6.8%	1
	X			X	4.4%	2
	X	X		X	2.2%	3
		X		X	1.6%	2
Former Smokers (<i>n</i> =8,286)					41.1%	0
	X				25.4%	1
	X	X			7.8%	2
		X			7.7%	1
				X	6.7%	1
	X			X	4.9%	2
	X				1.7%	1
	X	X		X	1.6%	3
Current Smokers (<i>n</i> =3,591)					27.6%	0
	X				27.3%	1
	X	X			9.4%	2
				X	8.2%	1
	X			X	8.0%	2
		X			6.9%	1
	X	X		X	4.0%	3
	X				2.4%	1

Note. Cluster analyses were conducted using two different methods of calculating distance (DGower and Euclidean distance) and two different methods of clustering (Ward's minimum-variance method and average linkage) (Rencher & Christensen, 2012). The entire sample of post-MI patients was randomly split in half and the four methods of clustering (two distance methods by two clustering methods) were used with each half followed by an examination of consistency in results.

Table 7.

Sociodemographic characteristics among respondents who experienced a lifetime myocardial infarction by total number of behavioral risks. BRFSS, United States, 2017.

	Total No. Risks			
	0 (n = 9,723) Weighted % (95% CI)	1 (n = 9,924) Weighted % (95% CI)	2 (n = 4,842) Weighted % (95% CI)	3+ (n = 1,515) Weighted % (95% CI)
Age (years)				
18-24	1.0 (0.4, 1.5)	1.0 (0.3, 1.1)	0.5 (0.2, 0.8)	2.8 (1.0, 4.7)
25-34	1.4 (0.9, 1.9)	2.3 (1.5, 3.1)	2.6 (1.6, 3.7)	4.6 (2.5, 6.7)
35-44	3.7 (2.6, 4.9)	5.5 (4.1, 6.8)	9.3 (6.4, 12.2)	10.7 (6.8, 14.6)
45-54	10.7 (9.2, 12.1)	12.1 (10.6, 13.5)	16.9 (14.3, 19.5)	23.3 (18.2, 28.3)
55-64	20.8 (19.0, 22.5)	26.4 (24.3, 28.5)	27.7 (24.9, 30.4)	33.8 (28.9, 38.7)
65 or older	62.4 (60.2, 64.6)	53.0 (50.8, 55.3)	43.0 (39.8, 46.2)	24.7 (20.9, 28.5)
Sex				
Female	34.9 (32.8, 36.9)	40.4 (38.2, 42.6)	41.5 (38.3, 44.6)	35.7 (30.6, 40.7)
Male	65.1 (63.0, 67.2)	59.4 (57.2, 61.6)	57.9 (54.6, 61.1)	64.3 (59.2, 69.3)
Education				
No school/only kindergarten	0.2 (0.1, 0.4)	0.3 (0.1, 0.5)	0.7 (0.2, 1.2)	0.2 (0.0, 0.5)
Grades 1 through 8	5.6 (4.3, 6.9)	8.7 (7.2, 10.1)	10.6 (8.4, 12.9)	10.5 (7.3, 13.7)
Grades 9 through 11	9.8 (8.4, 11.1)	15.9 (13.8, 18.0)	20.9 (18.0, 23.8)	27.1 (21.3, 32.8)
High school graduate	30.1 (28.1, 32.1)	31.6 (29.7, 33.6)	31.2 (28.5, 34.0)	30.3 (26.0, 34.6)
College 1 to 3 years	31.1 (29.0, 33.2)	28.9 (26.9, 30.9)	27.7 (24.5, 30.9)	25.8 (21.6, 30.0)
College graduate	22.9 (21.2, 24.5)	14.3 (13.0, 15.6)	8.5 (7.3, 9.8)	6.0 (4.4, 7.7)
No. days when mental health not good				
0	68.0 (65.8, 70.2)	60.8 (58.6, 63.0)	53.6 (50.4, 56.8)	35.8 (31.2, 40.5)
1-13	17.7 (15.8, 19.6)	16.9 (15.3, 18.5)	19.6 (17.1, 22.0)	23.2 (18.6, 27.7)
14+	12.1 (10.6, 13.5)	19.8 (17.9, 21.7)	24.6 (22.1, 27.2)	37.9 (32.8, 42.9)
Don't know/Refused	2.2 (1.6, 2.8)	2.5 (2.0, 3.0)	2.2 (1.5, 2.9)	3.1 (0.0, 7.2)

Note. Risks included: (a) current smoker status, (b) 0 minutes of physical activity per week, (c) consumption of < 1 vegetable daily, (d) heavy alcohol consumption, and (e) non-adherence to taking medications. 95% CI = 95% confidence interval.