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Evangelista, Lorraine S
Doering, Lynn V
Dracup, Kathleen

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Usefulness of a History of Tobacco and Alcohol Use in Predicting Multiple Heart Failure Readmissions Among Veterans*

Lorraine S. Evangelista, RN, PhD, Lynn V. Doering, RN, DNSc, and
Kathleen Dracup, RN, DNSc

Multiple hospital readmissions for heart failure (HF) are progressively increasing and may be related to continued tobacco and alcohol use. To study this relation, we conducted a retrospective chart audit of all veterans discharged with HF at a large Veterans Administration (VA) facility from 1997 to 1998. Using a multivariate logistic regression model, the smoking and alcohol use of patients who required >1 HF admission within 1 year were compared with those who did not. Demographic, clinical, and psychosocial variables were also included in the model. Of 753 patients admitted with HF during the review period (mean age 69.1 years, 99% men), 220 patients (29.2%) were readmitted to the hospital at least once (range 1 to 8 readmissions, mean 1.79 ± 0.27) after the index admission. In a multivariate analysis, current smoking (odds ratio [OR] 1.82; confidence interval [CI] 1.17 to 2.82) and current alcohol use (OR 5.92; CI 3.83 to 9.13) were independent predictors of readmissions. Other predictors included living alone (OR 2.09; CI 1.42 to 3.09), HF associated with ischemic etiology (OR 3.99; CI 2.58 to 6.18), higher New York Heart Association class (OR 2.57; CI 1.86 to 3.55), and care provided by a primary care physician compared with a cardiologist (OR 2.41; CI 1.57 to 3.67). This study confirms that noncompliance to smoking and alcohol restrictions, which are amenable to change, dramatically increases the risk for multiple hospital readmissions among patients with HF. Consequently, evaluation of noncompliance to smoking and alcohol consumption with targeted interventions in this population may be a key component for the reduction of multiple hospital readmissions. ©2000 by Excerpta Medica, Inc.

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T he present study was conducted to examine the relation between smoking and alcohol use and multiple heart failure (HF) readmissions in veterans. Our primary hypothesis was that continued smoking and alcohol use after an index admission for HF increases patients' rates of readmission during the 1 year after discharge. The purpose of the study was to compare patients who had a single HF admission with those patients who required ≥1 readmissions within 1 year after discharge from the index admission. The variables that were examined included current smoking and alcohol use, sociodemographics, health history, and support systems. The study aimed to answer the following research questions: (1) what is the readmission rate for patients with HF within a 1-year period after discharge; (2) what are the differences in smoking and alcohol use between patients who have a single HF admission and patients with >1 HF admission; and (3) are smoking and alcohol use predictors of multiple hospital admissions in patients with HF when other known predictors are considered?

METHODS

Study subjects and data source: The charts of 795 consecutive patients discharged with HF (International Classification of Disease ICD-9 codes 428.0, 428.1, and 428.9) from a large urban healthcare system for veterans during a 24-month period were audited retrospectively. The coded diagnosis of HF was verified by reviewing admission data and determining whether HF decompensation was the primary reason for admission. Medical records were excluded from further analysis if the main reason for hospital admission was unrelated to HF (e.g., cancer, elective surgery). Of the original 795 records, 42 records were for admissions not related to HF and were therefore excluded. The remaining 753 records were retained for data analysis.

The Patient Treatment Files (a National Administrative Database containing information on local Veterans Affairs hospitalizations) was reviewed to assess the number of readmissions for each of the 753 patients. We computed the rates of readmission per patient and the proportion of patients who were admitted within 1 year of their index admission. Patients with a single hospital admission during the 24-month review period (n = 533) were identified as group 1 and patients who had multiple hospital admissions (n = 220) were identified as group 2.

The admissions profile for the index HF admission for each of the 753 patients was reviewed by a single investigator (LE). A major focus of the chart review was obtaining current data that described behaviors related to smoking and alcohol use. The admitting physician used a standardized form to complete the history and physical examination on admission and routinely reviewed current lifestyle behaviors, including smoking and alcohol use at the time of admission. Smoking and alcohol behaviors were described in the records as "current," "former," or "never," and consequently the same descriptors were used to code these behaviors for the study. Smoking and alcohol history were also verified from other entries in the medical records (e.g., records of office visits, outpatient visits). For patients with multiple hospital admissions (n = 220), the data were again reviewed and verified for each subsequent admission.

To evaluate smoking and alcohol multivariately, factors already known to influence readmission rate, including demographic and clinical variables,[1,2] were collected for inclusion in the multivariate analysis. Information on patient characteristics was abstracted from the medical records. Based on previous studies, 2 other variables were examined: presence of social support measured by the patient's living arrangement (with someone or alone) and the specialty of the physician provider (primary care provider or cardiologist).

Patients living alone with inadequate social support systems were more likely to be hospitalized.[3] Although living alone does not, of itself, ensure family involvement and support, living alone has been documented as an indicator of noncompliance in patients with HF,[4] which in turn leads to rehospitalizations.

Previous researchers have found that patients with HF have fewer hospitalizations for HF decompensation and have higher physical function abilities when managed by HF specialists working in a dedicated HF program rather than by physicians with limited expertise in HF.[5] Because other researchers have shown that cardiologists are more likely to provide optimal pharmacologic therapy compared with generalists,[6] we hypothesized that they may also provide patients with more information about self-care measures, such as monitoring fluid balance with daily weights at home.[4,5] The treating physician during the index hospitalization and at follow-up after discharge was identified as the patient's physician provider. Generalists and internists were both coded as primary care provider.

Statistical analysis: Descriptive statistics was used to analyze readmission rates. We conducted univariate analyses to assess the impact of smoking and alcohol use, sociodemographics, clinical, and social support factors on multiple hospital readmissions. Group comparisons of patients with and without multiple admissions were conducted using chi-square statistics or t test, depending on the level of measurement. Bonferroni's correction was used to correct for multiple univariate comparisons. Eleven independent variables were considered. Therefore, for univariate compari-
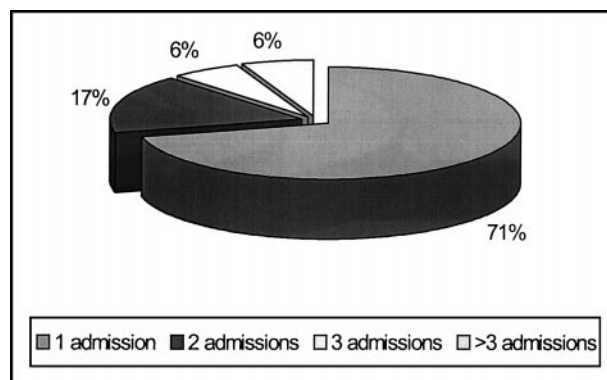

FIGURE 1. Distribution of number of admissions (n = 753).

sons, significance was set at p = 0.0005. Chi-square statistics and multiple logistic regression were used to assess the univariate and multivariate odds ratio for multiple admissions, respectively. Variables that achieved univariate significance of p <0.10 or variables that were considered theoretically important were included in a multivariate analysis. For multivariate analysis, 11 variables were entered in blocks in a hierarchical fashion. The 7 sociodemographic and clinical variables were entered first as a block, followed by 2 social support variables (living arrangements and type of provider), and finally smoking and alcohol use. Criteria for entry and removal of variables were based on the likelihood ratio test with enter and remove limits set at p ≤0.05 and p ≥0.100, respectively.

RESULTS

Mean age of the sample was 69 years (SD 11.7, range 33 to 99). Ninety-eight percent of the sample were men: 456 whites (60.6%), 214 African-Americans (28.4%), and 83 Hispanics or Asians (11%). A large number of subjects were retired (73.7%), with only 14.5% actually still working. Two hundred eighty-one patients (37.3%) were married and the remaining 474 (62.6%) were single, widowed, divorced, or separated.

Of the 753 patients in the sample, 533 (70.7%) had single admissions (index admission only). The remaining 220 patients (29.2%) had a total of 615 admissions. The mean readmission rate for the 220 patients with multiple hospital readmissions was 1.79 ± 1.27 (range 1 to 7). Figure 1 illustrates the distribution of the number of readmissions.

Table 1 provides a comparison of patients with single and multiple admissions. Significant differences were observed in 3 variables. A significant difference in smoking and alcohol use between the 2 groups was also observed. For all patients, noncompliance to smoking and alcohol use were 44.6% and 35.6%, respectively. For group 1 (single admissions), approximately 30% and 20% continued to smoke and drink, respectively. The noncompliance rates rose significantly to approximately 70% for smoking and

TABLE 1 Differences in Patient Characteristics Between Single (group 1) and Multiple Admission Groups (group 2)

	Group 1 (n = 533)	Group 2 (n = 220)	p Value
Age (yrs) (mean ± SD)	69.17 ± 11.70	69.00 ± 11.59	0.449
Gender			0.304
Men	98.5%	99.5%	
Women	1.5%	.5%	
Race			0.291
White	62.7%	55.9%	
Black	24.4%	38.2%	
Other races	12.9%	5.9%	
Marital status			0.872
Married	37.9%	37.3%	
Not married	62.1%	62.7%	
Living arrangement			0.001
Alone	44.1%	58.6%	
With someone	55.9%	41.4%	
Type of physician provider			0.000
Cardiologist	53.3%	28.6%	
General practitioner	46.7%	71.4%	
HF etiology			0.000
Nonischemic	69.0%	55.5%	
Ischemic	31.0%	44.6%	
NYHA class			0.000
1	40.3%	2.7%	
2	43.3%	84.5%	
3	16.3%	11.4%	
4	0.1%	1.4%	
HF (yrs) (mean ± SD)	5.09 ± 3.71	6.37 ± 5.58	0.001

NYHA = New York Heart Association.
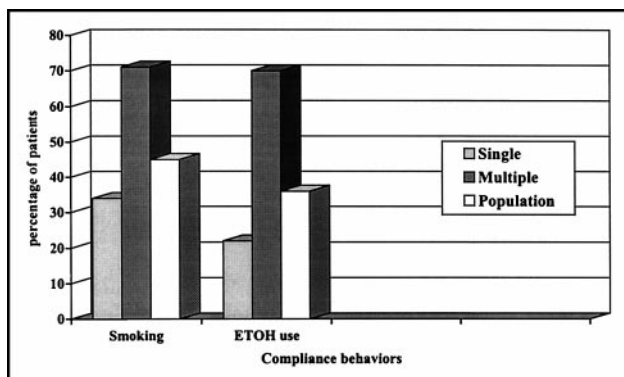
FIGURE 2. Noncompliance with smoking and alcohol use (ETOH) in patients with single admissions (n = 220) and patients with multiple admissions (n= 533).

alcohol use in patients with multiple readmissions (Figure 2).

The predictors of multiple readmissions in the multivariate model are presented in Table 2. Patients followed by cardiologists were compared with those cared for by primary care providers to determine if the 2 groups were different. Chi-square or *t* tests demonstrated no significant differences on the 7 demographic and clinical variables listed in Table 1.

The study also supported a high correlation (r = 0.527, p = 0.000) between noncompliance to smoking and noncompliance to alcohol restrictions among patients in the sample. This finding suggests that those who continued to smoke also continued to use alcohol.

DISCUSSION

Readmission rate: The readmission rate of 29.2% found in the present study is similar to earlier studies that examined readmission rates in patients with HF. Researchers have reported rates of readmission ranging from 27% to 47% within 3 to 6 months after initial admission.[3,5,7,8] Although early readmissions were common, a study examining readmission rates of Medicare enrollees with HF within 1 year from hospitalization showed equally high readmission rates of up to 50%.[3]

Smoking and alcohol use: The present study supports the hypothesis that current smoking and alcohol use predicts multiple hospital readmissions. Patients who continued to smoke and use alcohol were 2 and 5 times as likely to have multiple readmissions, respectively. The study also supports a moderately high correlation between continued smoking and continued alcohol use; patients who continued to smoke also continued to drink alcohol.

Smoking cessation is highly recommended in patients with HF because of its deleterious effects on cardiovascular physiology.[9] Patients with HF should be advised strongly to stop smoking and should be informed that continued smoking is associated with poorer outcomes. Although this may seem obvious, it does not appear to be a regular part of routine management for HF. Two studies have reported that patients with HF who smoked received documented advice to quit in only 9% to 11% of cases.[9,10]

Although the efficacy of specific smoking cessation methods has been studied widely in healthy persons, several studies have focused on cardiac patients in general, but none have focused on patients with HF specifically.[11] Approaches to smoking cessation that have been tested in cardiac patients include nicotine replacement (patch), behavioral counseling, and simple advice and encouragement from a health care provider. Overall low success rates for long-term (1-year) smoking cessation of 2% to 8% make it important that clinicians re-evaluate smoking habits periodically.[12]

Likewise, abstention from alcohol is essential in patients with confirmed alcoholic cardiomyopathy.[13] In addition, many clinicians have adopted a conservative approach and recommend complete alcohol abstention in patients with severe HF not related to alcohol, despite equivocal evidence regarding its efficacy in these patients.[14,15] Our finding that compliance to these recommendations is low, with 35.6% of patients with HF continuing to use alcohol, is comparable to other recent studies of up to 40% noncompliance to alcohol abstention.[16,17]

TABLE 2 Predictors of Multiple Heart Failure (HF) Readmissions (n = 753)

	OR	95% CI
Current alcohol use	5.92	3.83–9.13
HF associated with ischemic etiology	3.99	2.58–6.18
Higher NYHA class	2.57	1.86–3.55
Care provided by a primary care physician	2.41	1.57–3.67
Living alone	2.09	1.42–3.09
Current smoking	1.82	1.17–2.82

CI = confidence interval; OR = odds ratio; other abbreviation as in Table 1.

The fact that alcohol use was far higher among patients with multiple readmissions has important implications. Continued alcohol use after a HF diagnosis may be critical to the progression or exacerbation of the disease process. Previous research has indicated that alcohol interferes with a number of myocardial metabolic steps, but no single factor for the development of cardiac insufficiency related to alcohol has been identified, and there is evidence that abstention is effective only up to a certain stage of the disease.[15] Therefore, it seems more likely that continued alcohol use may be a general marker for health care usage either because patients with HF experience more health problems and seek help or because they engage in other noncompliant behaviors.

Other predictors of noncompliance: The clinical variables that predicted multiple hospital readmissions in the present study were HF of ischemic etiology and higher New York Heart Association class. The significant difference found among patients with ischemic HF may be due to the compounded effects of HF and coronary disease.

The absence of a support system also predicted multiple hospital readmissions in our study. The social support literature verifies the positive effects of social support on morbidity and mortality.[1,18] There is also reasonably strong research evidence linking family support and patient compliance.[19] Veterans are often elderly and in need of assistance with health care needs at home. Not having anyone to help with meals, transportation, medications, or symptom recognition puts them at higher risk for decompensation.

The present study also supports a strong correlation between multiple hospital admissions and care provided by a primary care physician. Those patients seen by a primary care provider as opposed to a cardiologist were almost 2½ times as likely to have multiple hospital readmissions. Similarly, previous researchers have found that patients with HF have fewer hospitalizations for HF and are significantly more functional when managed by HF specialists working in a dedicated HF program rather than by physicians with limited expertise in HF.[5,6,20,21] Researchers have shown that differences in treatment strategies (e.g., frequency of angiotensin-converting enzyme inhibition use) between generalists and specialists predicted patient outcomes,[6] but information of medical pre-scriptions of our sample was not obtained during the chart reviews. Therefore, these results should be interpreted with extreme caution. Our data, although provocative, are preliminary and should not be used to label the care of primary care providers as inadequate. Additional research that examines how physician specialty influences patient compliance with smoking and alcohol restrictions needs to be done to provide a better explanation of the variance observed in the present study.

Although the present study allows us to identify patients at risk for multiple hospital readmissions, additional follow-up studies are needed to further explicate the variables that were found to predict multiple hospital readmissions. These future studies need to include more women and patients with different socioeconomic status or access to health care. Efforts should focus on identifying patients at risk, educating them, and referring them for medical evaluation and treatment to specialists to prevent HF decompensation.

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