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Life's Simple 7 and Health Care Utilization among the Framingham Generation III Cohort

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Abstract

Objective: To evaluate associations of cardiovascular health status with utilization of healthcare services.

Methods: Our study included 3,786 participants from the Framingham Third Generation Cohort (enrollment: May 2008 – February 2011). LS7 0-14 point summary scores were categorized as "suboptimal" (score of 0-7) and "optimal" (score of 8-14). Participants were stratified into two utilization groups. Those with 0-1 utilizations were compared to those with 2 or more visits ("Super Users"). Logistic regression was used to estimate associations of the two LS7 categories with the odds of "Super User" utilization (models adjusted for age, sex, race, and education).

Results: Compared to those with "suboptimal" LS7 scores, participants with "optimal" LS7 scores had a 40.5% lower odds (95% confidence interval: 28-51%) of being a "Super User" of health care services ($p<0.005$).

Conclusions: In a younger population, higher LS7 cardiovascular health metric scores were associated with lower utilization of costly health care services.

Public Health Implications: These results may have implications for primary care physicians and other health professionals to help identify patients at risk for over-utilization of higher-cost health care services.

Introduction

In 2016, cardiovascular diseases (CVD) cost the U.S. $555 billion dollars. Experts estimate CVD-related costs will exceed $1 trillion dollars by 2035.[1] In 2010, the American Heart Association (AHA) developed the "Life's Simple 7" (LS7) metric to track the population's cardiovascular health. The metric includes 7 CVD risk factors or behaviors, including body mass index (BMI), blood pressure, cholesterol, glucose, physical activity (PA), cigarette smoking, and diet.[2] Unfavorable (i.e., lower) LS7 scores have been associated with increased CVD risk.[3-5] LS7 scores were also related to utilization of emergency room (ER) visits and hospitalizations in Medicare beneficiaries aged 65 and older.[6]

The AHA proposes that population-level LS7 modification at even modest levels could improve mortality rates from CVD.[2] Whether LS7 measures can be used to predict utilization of costly health care services is not known, especially among younger populations.

We examined the relationship between LS7 scores and health care utilization in participants of the Framingham Generation III (Gen 3) cohort. We hypothesized that higher LS7 scores in younger adults would be associated with lower rates of costly health care utilization.

METHODS

Study Population

We conducted a cross-sectional analysis using data from the Framingham Gen 3 Exam 2 cohort (enrollment: May 2008 – February 2011).[7] Gen 3 included 4,586 men and women aged 19+ years who had at least one parent in the Framingham Offspring study. Our study included 3,786 Gen 3 participants with available data allowing us to calculate LS7 scores. The University of Vermont Institutional Review Board has reviewed this project and determined that it qualifies as exempt from additional review.

Life's Simple 7 Definitions

LS7 variables (smoking status, diet, physical activity, BMI, blood pressure, total cholesterol, and hemoglobin A1c (HgBA1c) were stratified into "poor", "intermediate", or "optimal" categories as described previously.[2,3] LS7 categories were changed slightly from the

original AHA guideline[2] by using HgBA1c in place of fasting glucose and by using updated AHA blood pressure and physical activity (PA) guidelines.[8,9]

Statistical Analysis

An overall LS7 summary score ranging from 0 to 14 was calculated as the sum of the 7 individual component scores (individual LS7 variables each received a score of 0-2 as described).[3] This summary score was stratified further into two health metrics, categorized as "sub-optimal" (summary score: 0 to 7), and "optimal" (summary score: 8-14).

For the utilization outcome, emergency room visits, hospitalizations, and major medical illnesses were combined into 'utilization' groups. The utilization groups were then stratified into a reference group of 0-1 visits and a "Super User" group of 2 or more visits.

Binary logistic regression was used to calculate odds ratios (OR) and 95% confidence intervals (CIs)[10] of utilization by the two LS7 summary score categories. Models were adjusted for age, sex, race, and education. SPSS Version 25 was used for all data analysis.

Results

Approximately half of the Gen 3 participants in our study were women and 78% were Caucasian. Mean age was 46.0 years. Education and income levels were high; 46.7% had a bachelor's degree or higher and 46.9% had incomes ≥$75k. A majority of the study population (66.0%) had an LS7 summary score ≥8; 14.5% had LS7 summary scores ≤7. Of the 82.3% of the original Gen 3 cohort who completed the second survey, healthcare utilization of costly services was low; 65.7% made 0-1 visits and 16.6% made 2 or more visits.

Table 1 shows that those with an "optimal" LS7 score (summary score 8-14) had a 40.5% lower odds (95% CI: 28-51%; P<0.005) of being a "Super User" compared to those with a "suboptimal" LS7 score (0-7) when controlling for age, sex, race, and education.

Table 1. Binary Logistic Regression Model for the association of LS7 Cardiovascular Health Categories with "Super User" health care utilization category in the Framingham Gen 3 Cohort

Exposure Variable	Odds Ratio	95% CI	P-value
LS7 Score categories (≤7 compared to ≥8)	0.595	0.49-0.72	<0.005
Female gender (compared to male)	0.95	0.81-1.12	0.52
Caucasian race (compared to non-Caucasian)	0.88	0.61-1.25	0.47
Age (per 1-year increase)	1.00	0.99-1.00	0.76
Education (< college compared with bachelor's degree and above)	0.96	0.91-0.99	0.04

Discussion

We evaluated cross-sectional relationships of the AHA's LS7 cardiovascular health metric with utilization of costly health care services. Our results showed higher LS7 summary scores were associated with decreased utilization of health care services from ER visits, hospitalizations, and major illnesses. These findings suggest that the AHA's LS7 cardiovascular metric may be a useful tool for assessing healthcare utilization at individual and population levels.

Lower LS7 scores are predictive of incident CVD.[3-5] Our results showing a higher LS7 score was associated with lower odds of being a "Super User" of costlier health care services is consistent with these findings; CVD and stroke are leading causes of healthcare expenditures.[1,2] The present study expands upon the existing literature by demonstrating the potential of using LS7 scores to assess all-cause healthcare utilization related to emergency room and hospital care settings among younger populations.[6]

Public Health Implications

Health care payers are moving to payment models based on population health, and health care systems are forming Accountable Care Organizations to accommodate these changes. Increasingly health care organizations are incentivized to reduce costs. Innovative, simple ways to screen high risk individuals using a tool such as the LS7 may enable healthcare providers to identify and intervene before such individuals become "Super Users".

Our study is limited by the homogeneity of the Gen 3 cohort. The population is largely Caucasian with minimal representation from minorities. Compared to the rest of the U.S., the distributions of favorable health status, education, and income are high and may have limited generalizability. Despite these limitations, our study demonstrates that poorer health profiles, as determined by lower LS7 scores, were associated with higher utilization of costly health services. Strengths of our study include the contemporary nature of the Gen 3 cohort, the large sample size, and our novel evaluation of the LS7 metric.

In summary, we have demonstrated higher AHA's LS7 cardiovascular health scores were associated with lower utilization of costly health care services in a younger population with high SES. If confirmed, these results may have implications for primary care providers and other health professionals to identify "Super Users" and intervene with prevention programs before costly chronic diseases develop.

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