Available online at www.sciencedirect.com
ScienceDirect
Preventive Medicine 46 (2008) 247–251
Preventive Medicine
www.elsevier.com/locate/ypmed

Multiple health-risk behavior in a chronic disease population: What behaviors do people choose to change?

John P. Allegrante [a,b,*], Janey C. Peterson [c], Carla Boutin-Foster [c], Gbenga Ogedegbe [d], Mary E. Charlson [c]

[a] Department of Health and Behavior Studies, Teachers College, Columbia University, New York, NY 10027, USA
[b] Department of Sociomedical Sciences, Mailman School of Public Health, Columbia University, New York, NY 10032, USA
[c] Division of General Internal Medicine and Center for Complementary and Integrative Medicine, Weill Medical College of Cornell University, New York, NY 10065, USA
[d] Center for Behavioral and Cardiovascular Health, Division of General Medicine, Columbia University College of Physicians and Surgeons, New York, NY 10032, USA

Available online 10 October 2007

Abstract

Objective. To determine what health behaviors patients choose to change in response to medical advice when they are given the potential net-present value (reduction in biological age) of modifying a behavior.

Methods. Baseline data for multiple health-risk behaviors that were recommended for change among 660 coronary angioplasty patients at the New York-Presbyterian Hospital-Weill-Cornell Medical Center who were enrolled during 2000–02 in one of two arms of a behavioral intervention trial designed to compare different approaches to communicating health risk (net-present vs. future value) were analyzed using multivariate statistical methods.

Results. Although there was no difference between study arms, knowing the biological-age value of behaviors, stage of change, and the total number of behaviors recommended for change was associated with choosing several behaviors. Notably, stage of change was associated in both groups with strength training (intervention OR 2.82, 95% CI 1.85, 4.30; comparison OR 2.84, 95% CI 1.83, 4.43, $p<.0001$) and reducing weight (intervention OR 2.49, 95% CI 1.32, 4.67, $p=.005$; comparison OR 1.98, 95% CI 1.80, 3.31, $p=.01$).

Conclusion. Patients with coronary disease are more likely to choose strength training and reducing weight regardless of knowing the biological-age reduction of any given behavior.

Keywords: Angioplasty; Behavioral medicine; Behavioral research; Biological age; Cardiovascular risk reduction; Chronic disease; Health behavior; Health-risk appraisal; Intervention research; Multiple behavior change

Introduction

Although there is growing interest in developing better theory to inform effective intervention on multiple health behaviors, surprisingly little is known about what behaviors people choose to modify in response to medical recommendations (Nigg et al., 2002; Noar and Zimmerman, 2005; Smedley and Syme, 2000). Moreover, what behaviors people choose to change, why, and the extent to which knowing the health benefit of changing any one health-risk behavior over another influences the choice of behavior to change are questions that remain unanswered (Allegrante and Roizen, 1998; Charlson et al., 2002).

This study sought to determine which of 12 cardiovascular health-risk behaviors patients with coronary artery disease would choose to change when presented with an explicit, theoretically derived potential health gain of each behavior. We also investigated whether knowing the net-present value of the behavior change, stage of change, and the total number of behaviors recommended for change were associated with patient choices.

* Corresponding author. Department of Health and Behavior Studies, Teachers College, Columbia University, New York, NY 10027, USA. Fax: +1 212 678 8259.
E-mail address: jpa1@columbia.edu (J.P. Allegrante).

0091-7435/$ - see front matter © 2007 Elsevier Inc. All rights reserved.
doi:10.1016/j.ypmed.2007.09.007

Methods

This analysis utilized baseline data drawn from a randomized controlled trial that was conducted from 1999 to 2003. The trial was approved by the Institutional Review Board of the Weill Cornell Medical College. We have previously described the methods (Charlson et al., 2002) and reported the results (Charlson et al., in press) of the trial.

The concept of net-present value was operationalized by assigning theoretical estimates of the potential reduction in biological age associated with various health behaviors. Thus, a specific estimate of the reduction in biological age that could be achieved if a patient was able to successfully undertake the behavior change was used as the metric of the net-present value of the behavior change. For example, if a 58-year-old male smoker stopped smoking, his biological age could be reduced by 3 years, to 55 years of age (Allegrante and Roizen, 1998). A future-value approach to risk communication was operationalized in the comparison arm by presenting the patient with standard risk reduction approach as the potential to reduce risk of future negative outcomes.

Sample

Data were collected from 660 patients (mean age, 63 years; 73% male, 21% African American or Latino, and 62% married) who had undergone percutaneous transluminal coronary angioplasty, or stenting, for at least single-vessel stenosis. There were no statistically significant baseline differences between patients in the two arms of the trial.

Measures

All patients completed a baseline assessment of 12 cardiovascular health-risk behaviors. The health-risk behavior assessment that was used to calculate biological age was based on a research version of RealAge®, a commercial health-risk assessment program available to the public (www.realage.com). A health-risk behavior became a potential candidate for change when a patient's individualized health-risk profile indicated that the behavior was outside the recommended range. The goal was to provide patients with an individualized profile where each health-risk behavior was assigned a weight according to its potential impact on mortality. Stage of change (Prochaska et al., 1992) was assessed by asking patients whether they were seriously considering changing a risk-factor behavior of interest within the next 6 months, using a single-item rating scale (1 = precontemplation, 2 = contemplation, 3 = preparation, 4 = action, 5 = maintenance).

Procedure

Each patient in the intervention arm was presented with an individualized health-risk profile listing the behaviors for potential change, along with an estimate of the reduction in biological age that the patient could achieve through behavior change. This information was presented by showing the patient an individualized cardiovascular risk reduction plan, which contained both the patient's biological and chronological ages. The plan listed individualized health recommendations for change, the normal range for each of the recommendations, and the results of the patient's individualized health-risk assessment in relation to each recommendation, including the potential reduction in biological age associated with choosing each specific behavior. Patients in the comparison arm received an individualized health-risk profile listing the candidate behaviors for potential change.

Patients could choose to change behaviors in five domains of the assessment: (1) *Physical activity* — increasing overall physical activity, aerobic exercise, or strength training; (2) *Smoking* — stopping smoking (or continuing not to smoke); (3) *Diet/weight* — reducing weight, reducing red meat consumption, reducing dietary intake of cholesterol, increasing flavonoids, or increasing folic acid; (4) *Blood pressure/diabetes control* — controlling blood pressure or diabetes (specifically blood glucose levels); and (5) *Medications* — Taking beta blockers to reduce heart rate. All patients were asked to choose up to 3 behaviors to change. Patients were instructed at the baseline evaluation to consult with their cardiologist prior to undertaking any behavioral changes. Thus, the choices reflected the patient's preferences, not the physician's preferences.

Statistical analyses

All data were analyzed using SAS (Cary, NC). First, we calculated the estimated reduction in biological age associated with each of the 12 cardiovascular health-risk behaviors for patients enrolled in the intervention arm. Second, we used multiple logistic regression to estimate the likelihood of patients choosing any given behavior within each randomization group, by biological age (in the intervention group), stage of change, and the total number of health-risk behaviors recommended for change, by calculating the adjusted odds ratio (OR) and associated 95% confidence interval (CI). Third, we used chi-square analysis to compare the individual, *within-patient* rates of adoption for each health-risk behavior between the two groups. In order to take into account each intervention patient's individual health-risk profile and the estimated reduction in biological age associated with that profile, only patients for whom the health-risk behavior was among the top two most highly weighted behaviors in terms of biological-age reduction were included in this analysis. The adoption rates for these individuals were then compared to those of individuals in the control group. The *a priori* level of significance for all analyses was set at $p \leq .05$.

Results

Estimated reduction in biological age

Table 1 shows the estimated reduction in biological age associated with the 12 cardiovascular health-risk behaviors that were calculated for patients in the intervention arm who had received a recommendation for change in that behavior. The behaviors that yielded the greatest reductions in biological age included controlling diabetes (4 years) and stopping smoking (3 years) followed by controlling blood pressure, increasing aerobic exercise, reducing heart rate, reducing weight, strength training, increasing overall physical activity, and lowering

Table 1
Estimated reduction in biological age associated with 12 cardiovascular health-risk behaviors for patients enrolled in the experimental intervention arm who received a recommendation for change at baseline (N=329)

		Estimated reduction in biological age (in years)		
Cardiovascular health-risk behavior	*n*	Range	Mean	SD
Controlling diabetes	27	1.09–9.34	4	2.19
Stopping smoking	88	0.26–6.63	3	1.66
Controlling blood pressure	194	0.11–9.0	1	1.21
Increasing aerobic exercise	116	0.10–9.0	1	0.98
Reducing heart rate	59	0.13–3.78	1	0.66
Reducing weight (BMI)	180	1.00–3.05	1	0.56
Strength training	263	0.18–2.43	1	0.45
Increasing overall physical activity	286	0.14–2.15	1	0.36
Lowering LDL cholesterol	286	0.11–3.37	1	0.36
Increasing flavonoids	143	0.16–0.79	0.37	0.09
Increasing folic acid	106	0.10–0.55	0.21	0.12
Lowering red meat consumption	182	0.11–1.19	0.20	0.09

Note. The estimates of potential reduction in biological age shown are theoretically derived and based on a research version of RealAge®, a commercial health-risk assessment program that is designed to measure physiologic changes associated with aging due to behavior and lifestyle. Patients in the intervention arm of the trial (N=329) were told that by maintaining a particular health behavior they could achieve the age reduction shown as being associated with the behavior. The *n* shown for each cardiovascular health-risk behavior represents the number of patients for whom the health-risk behavior was recommended at baseline for change.