Baseline risk has greater influence over behavioral attrition on the real-world clinical effectiveness of cardiac rehabilitation

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Abstract

Objective: Few studies have examined the correlates of real-world cardiac rehabilitation (CR) effectiveness. The objective of this study was to determine the relationship between baseline risk, behavioral attrition, and the number needed to treat (NNT) associated with CR.

Study Design and Setting: A retrospective study was conducted among 16,061 CR patients between 1995 and 2011 in Canada. Multiple logistic regression models were derived from patient characteristics and measured baseline risk (individual's risk of death within 3 years) and behavioral attrition (individual's risk of premature dropout). We examined the treatment efficacy of CR among nondropouts using a 20% relative risk reduction. Further sensitivity analyses were performed to assess the robustness of our assumptions. We assumed no efficacy among dropouts.

Results: Both baseline risk and behavioral attrition were independently associated with NNT, although baseline risk had a stronger association with NNT than behavioral attrition. Increasing age, lower baseline fitness, history of diabetes, hypertension, and greater comorbidities were associated with lower NNT. Being female, living alone, living in the lowest neighborhood income quintile, and greater adiposity were associated with higher NNT.

Conclusion: The clinical effectiveness of CR is largely driven by the baseline risk rather than the behavioral attrition of the populations they serve. These findings have implications for risk stratification among those with greatest survival yields and programmatic needs. © 2016 Elsevier Inc. All rights reserved.

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1. Introduction

Cardiac rehabilitation (CR) programs have been shown to be highly efficacious in reducing the risk of mortality and rehospitalization for patients who have had acute coronary syndromes or have undergone recent coronary revascularization procedures [1]. However, compared to the controlled conditions placed on determining efficacy, the clinical effectiveness of these programs in real-world settings is determined by the characteristics of the populations they serve. For example, studies suggest that the absolute risk reduction as a result of CR will be most pronounced among those at highest baseline risk [2,3]. Conversely, the associated survival yields are expected to be negligible among those who prematurely dropout of CR [4,5]. To our knowledge, the interrelationship between baseline risk, behavioral attrition (premature dropout), and the number needed to treat (NNT) associated with CR is unknown. NNT is an important outcome as it provides an absolute measure of treatment effect by estimating the number of patients that need to be treated to have an impact on one person [6]. This concept is clinically

What is new?

Key findings
- Both the baseline risk and behavioral attrition of patients were independently associated with cardiac rehabilitation (CR) clinical effectiveness. Baseline risk was found to have a stronger association than behavioral attrition on the corresponding number needed to treat (NNT).

- Increasing age, lower baseline fitness, diabetes, hypertension, and greater comorbidities were associated with lower NNT, whereas women, living alone, the socioeconomically disadvantaged, and with greater adiposity, were associated with higher NNT.

What this adds to what was known?
- Until now, the importance of baseline risk and behavioral attrition on the clinical effectiveness of CR among real-world populations were unknown.

- Although CR programs have been shown in clinical studies to be highly efficacious, when factoring in the baseline risk and behavioral attrition of the populations they serve, baseline risk was found to be the major determinant of the absolute risk reductions and survival yields associated with these programs.

What is the implication and what should change now?
- Our findings can inform CR delivery for patients whom the expected survival yields and programmatic attentiveness needs are greatest.

informative, as we know that not everyone is helped by an intervention—some benefit, some are harmed and some are unaffected.

The objective of this study was to examine how the baseline risk and behavioral attrition profiles of a population participating in CR correlate with the NNT associated with the program. A secondary objective was to determine which patient profiles (if any) correlated with more or less favorable NNT.

2. Methods

2.1. Context and setting

This study was conducted at the Cardiac Prevention and Rehabilitation Program (Rumsey Center) of the University Health Network-Toronto Rehabilitation Institute in Toronto, Ontario, Canada. Of approximately 220 CR programs in Canada, the Rumsey Center is among the largest by patient volume, accommodating up to 1,800 patients weekly and servicing a territory that encompasses 2.2 million mostly urban-dwelling Canadians. The Rumsey Center is publicly funded with services provided free of charge, and a physician will refer a patient to the program a minimum of 4–8 weeks after cardiovascular event or surgical intervention. Patients are expected to attend once a week for 6 months and participate in a standard CR protocol of individualized weekly exercise sessions, one-on-one counseling, education, and peer-to-peer support [7,8]. Mortality reductions associated with the Rumsey Center program are consistent with meta-analyses of clinical trials [4].

2.2. Study population and data collection

This study received Research Ethics Board approval from the University Health Network-Toronto Rehabilitation Institute (Toronto, Canada). We retrospectively obtained data from consecutive patient entries to the Rumsey Center from 1995 to 2011. The inclusion criteria were CR patients with a record of at least one onsite program visit after their initial intake assessment. Baseline sociodemographic and clinical variables were obtained by linking administrative and clinical registry data through the encrypted health card numbers of each patient. Anthropometric data were made available through onsite patient assessments and cardiorespiratory stress testing at baseline (intake), midprogram (3 months) and on program completion (6 months). Prior cardiac hospitalizations were identified through hospital discharge abstracts obtained from the Canadian Institute of Health Information's Discharge Abstract Database (DAD) using a retrospective period of 5 years. Information on cardiac and noncardiac comorbidities was obtained from primary and secondary diagnostic fields for each corresponding hospital admission. Data on previous cardiovascular procedures including coronary angiography, percutaneous coronary intervention, and bypass surgery were obtained through physicians' claims (the Ontario Health Insurance Plan) and DAD databases for the 5 years before referral. The use of DAD and physicians' claims data to identify comorbid diseases and coronary procedures have been previously used and validated [9]. Diabetes and hypertension history were identified using disease-specific validated algorithms from the Ontario Health Insurance Plan and DAD databases [10]. A proxy measure of socioeconomic status was determined by neighborhood income using 2001 Ontario Census data. Neighborhood income was categorized into quintiles, from lowest income (first quintile) to highest income (fifth quintile). Any deaths occurring within 3 years following a patient's prescheduled completion of CR at the Rumsey Center were determined using the Ontario Ministry of Health and Long-Term Care Registered Persons Database.