

# Cardiac Rehabilitation Improves Survival and Cardiorespiratory Fitness in Elderly Patients with Multimorbidity

Tamara M. Williamson<sup>1</sup>; Ross Arena<sup>2,3</sup> Trina Hauer<sup>3</sup>, Codie Rouleau<sup>1,2,3</sup>, Tavis Campbell<sup>1,3,4</sup>, Deepika Laddu<sup>2</sup>, Cemal Ozemek<sup>2</sup>, Sandeep Aggarwal<sup>3,4</sup>, Leslie Austford<sup>3</sup>, & Daniele Chirico<sup>3</sup>

<sup>1</sup>Department of Psychology, University of Calgary; <sup>2</sup>Department of Exercise Sciences, University of Illinois at Chicago.  
<sup>3</sup>TotalCardiology™ Rehabilitation and Risk Reduction, Calgary, AB; <sup>4</sup>Libin Cardiovascular Institute of Alberta, Calgary, AB.

## Background

- Elders (65+) with cardiovascular disease (CVD) present unique health care challenges owing in part to a high prevalence of multimorbidity (i.e., ≥1 additional comorbidity in addition to CVD)
- While there is ample evidence that cardiac rehabilitation (CR) improves prognosis and exercise capacity among patients with CVD generally, elders and individuals with multimorbidity are often excluded from study samples
- Understanding the potential benefits of CR completion among elders with multimorbidity in terms of long-term survival and CVD risk factors is critical to optimizing clinical care in this vulnerable population

## Objective & Hypothesis

- This study aimed to characterize the impact of CR completion on survival and risk factors, including CRF, among elderly adults with multimorbidity.
- It was hypothesized that completing the 12-week CR program would convey a survival advantage relative to non-completion, and CVD risk factors would improve at 12-weeks among elders who completed CR

## Methods

- Elderly patients with CVD and ≥1 comorbidity (diabetes, chronic obstructive pulmonary disease, liver disease, gastrointestinal disease, malignancy, and/or renal disease) were referred to a 12-week exercise-based CR program in Calgary, AB. All-cause mortality was tracked over a 5-year follow-up period
- Patients who completed CR underwent a symptom-limited exercise test pre-CR and at the end of the 12-week exercise program.
- Peak metabolic equivalents (METs) were determined by workload achieved on a maximal exercise stress test. CVD risk factors were assessed pre-CR and at 12-weeks as part of standard care.

## Results

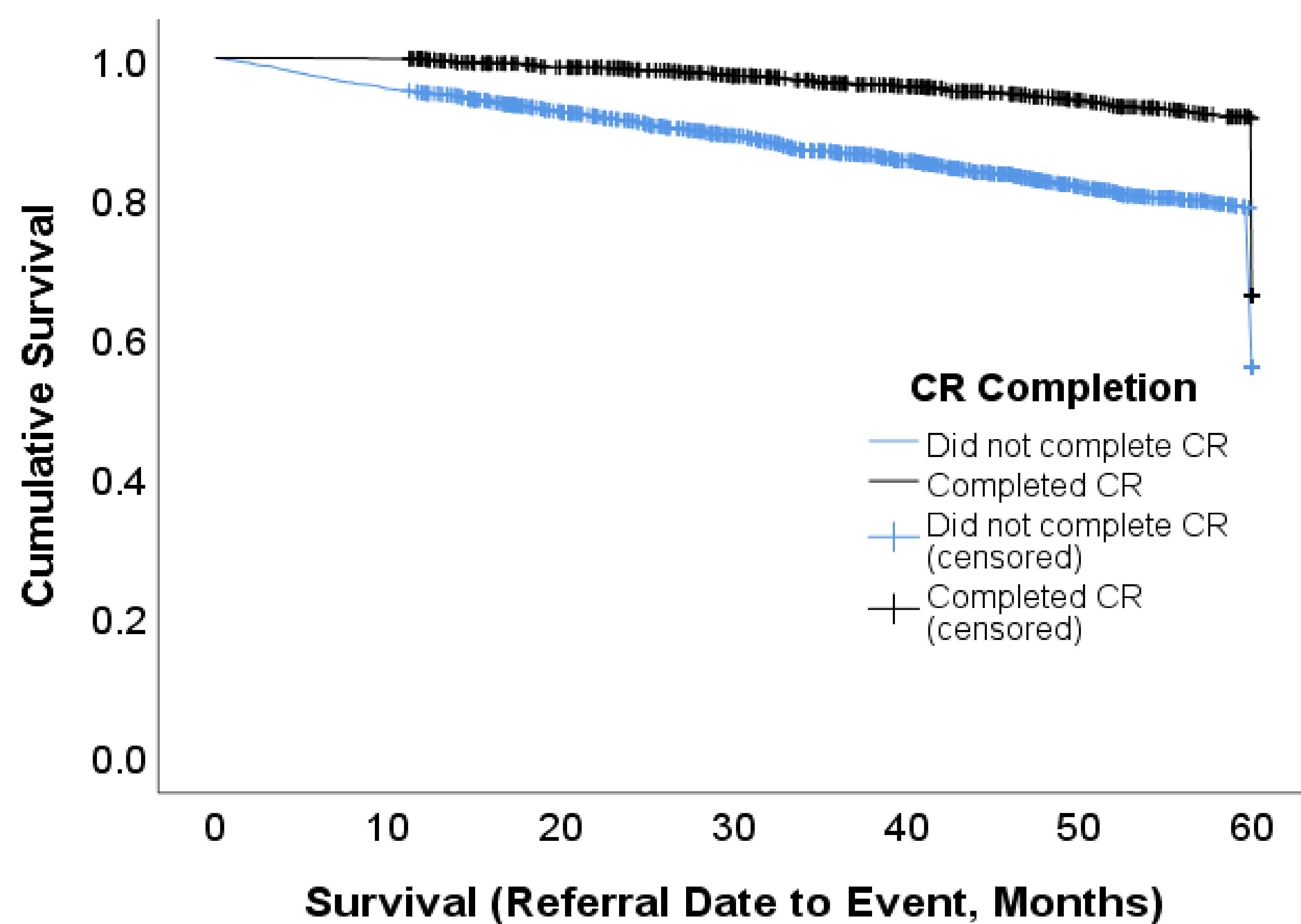
- Of the 3,874 patients with multimorbidity (73 ± 6 years; 74% men) included in the analysis, 62% did not complete CR (see Table 1).
- Kaplan-Meier survival analyses indicated a 5-year post-referral survival advantage among elders with multimorbidity who completed CR (75% vs. 67%, Log rank chi-square (1) = 65.98,  $p < .001$ ), Figure 1.
- Cox regression (forward-stepwise method) adjusting for age, sex, and BMI indicated that CR completion was a strong predictor of 5-year survival, residual chi-square = 60.96, HR = 0.60 (95%CI = 0.52-0.68).
- Among CR completers, peak METs improved from baseline (6.01 ± 1.81) to 12-weeks (6.82 ± 1.88), and HDL, LDL, total cholesterol, triglycerides, and waist circumference also improved ( $p$ 's < .001)

## Results

**Table 1. Age, comorbidities, and survival among elderly men and women with multimorbidity who completed and did not complete CR (N = 3,874)**

	Did not Complete CR			Completed CR		
	Men	Women	Total	Men	Women	Total
<b>N (%) or Mean ±SD</b>	1683 (70.3)	712 (26.7)	<b>2,395</b>	1181 (80)	298 (20)	<b>1,479</b>
<b>Age</b>	73±6	74±6	<b>74±6</b>	72±5	73±5	<b>72±5</b>
<b>5 year survival (months)</b>	46.26 ±17.46	45.63 ±17.84	<b>46.07 ±17.57</b>	50.94 ±14.72	50.79 ±14.80	<b>51 ±14.72</b>
<b># of Deaths</b>	555 (33)	233 (32.7)	<b>788 (33)</b>	304 (25.7)	60 (20)	<b>364 (25)</b>
<b>Diabetes (Type I or II)</b>	951 (56.5)	392 (55.1)	<b>1343 (56.1)</b>	617 (52.2)	136 (45.6)	<b>753 (50.9)</b>
<b>COPD</b>	642 (38.1)	272 (38.2)	<b>914 (38.2)</b>	408 (34.5)	101 (33.9)	<b>509 (34.4)</b>
<b>Liver Disease</b>	34 (2)	12 (1.7)	<b>46 (2)</b>	21 (1.8)	9 (3)	<b>30 (2)</b>
<b>GI Disease</b>	189 (16)	145 (20.4)	<b>413 (17.2)</b>	268 (15.9)	70 (23.5)	<b>259 (17.5)</b>
<b>Malignancy</b>	243 (14.4)	89 (12.5)	<b>332 (13.9)</b>	194 (16.4)	50 (16.8)	<b>244 (16.5)</b>
<b>Renal Disease</b>	157 (9.3)	57 (8)	<b>214 (8.9)</b>	81 (6.9)	7 (2.3)	<b>88 (5.9)</b>

Note. COPD = chronic obstructive pulmonary disease; CR = cardiac rehabilitation; GI = gastro intestinal



**Figure 1. Survival (months) past CR referral among elders with CVD and multimorbidity who completed and did not complete a 12-week CR program.**

## Conclusions

- Completing a 12-week exercise-based CR program improves CVD risk factors, including CRF, and reduces 5-year mortality risk among elder patients with multi-morbidity
- This study's results suggest to clinicians that CR is an important component of CVD care in this high-risk population

