Relation between initial treatment strategy in stable coronary artery disease and 1-year costs in Ontario: a population-based cohort study

Jaskaran S. Kang MD, Maria C. Bennell MPH, Feng Qiu MSc, Merril L. Knudtson MD, Peter C. Austin PhD, Dennis T. Ko MD MSc, Harindra C. Wijeysundera MD PhD

Abstract

Background: Cardiovascular disease is costly, and annual expenditures are projected to increase. Our objective was to examine the variation in patient-level costs and identify drivers of cost in patients with stable coronary artery disease.

Methods: In this retrospective cohort study using administrative databases in Ontario, Canada, we identified all patients with stable coronary artery disease after index angiography between Oct. 1, 2008, and Sept. 30, 2011. We excluded patients with a myocardial infarction within 90 days before the index, with normal coronaries, or with mild coronary disease. We categorized hospitals into low, medium or high revascularization ratio centres. The primary outcome was cumulative 1-year health care costs. A hierarchical generalized linear model identified patient, physician and hospital characteristics associated with patient costs, with 2 main covariates of interest: treatment allocation (medical v. percutaneous coronary intervention v. coronary artery bypass grafting) and hospital revascularization ratio.

Results: A total of 183 630 angiography procedures were performed in Ontario during the study period. The final cohort included 39 126 patients with stable coronary artery disease, of which 15 138 received medical treatment and 23 988 received revascularization. The mean 1-year cost was $24 026 (interquartile range $8235–$30 511). The mean costs for medical management and revascularization were $18 069 and $27 786, respectively. The strongest predictor of costs was revascularization (percutaneous coronary intervention: cost ratio 1.27, 95% CI [confidence interval] 1.24–1.31; coronary artery bypass grafting: cost ratio 2.62, 95% CI 2.53–2.71). Hospital revascularization ratio did not significantly affect costs. There was no significant interaction between treatment and revascularization ratio.

Interpretation: Most health care costs were due to acute care hospital admissions, and costs were higher for patients undergoing revascularization than medical therapy. This study suggests that treatment decision has a substantial impact on health care resources.

Coronary artery disease is a leading cause of morbidity and mortality,[1] and as such represents a major economic burden on health care expenditures.[2] The cost of cardiovascular disease and stroke is $7.6 billion in Canada for direct health care costs annually and $14.6 billion for indirect costs of disability or death, with expenditures projected to increase.[3]

Treatment for stable coronary artery disease includes medical therapy alone or in combination with revascularization by either percutaneous coronary intervention or coronary artery bypass grafting. There is ongoing controversy as to the best initial treatment strategy despite numerous landmark trials that suggest the 2 treatment choices are equivalent with regard to death, major adverse cardiovascular events and symptom relief.[4–6] This debate has resulted in significant variation in clinical practice.[7] Understanding the potential impact of such practice variation on resource use is important. This is especially relevant given the current era of substantial budgetary constraints, where there is high priority for the efficient use of scarce health care resources. Indeed, recent guidelines from professional cardiovascular societies reinforce the importance of incorporating value and resource implications into health care decisions.[8]

Although there are studies examining the predictors of initial treatment strategy in patients with stable coronary artery disease, there is a paucity of literature on the impact of the different treatment strategies on health care costs. Accordingly, we sought to address this gap in knowledge by studying the cumulative 1-year health care costs in patients diagnosed with stable

coronary artery disease after a coronary angiogram, using a population-based clinical registry of patients in Ontario, Canada. Ontario is Canada's largest province with about 14 million residents, all of whom receive universal health coverage provided by a single third-party payer, the Ontario Ministry of Health and Long-term Care. Our objectives were to determine the degree of variation in health care costs and understand the predictors of cumulative health care costs. We were interested in the relation between initial treatment strategy (medical management v. revascularization) as well as the impact of the hospital revascularization ratio on subsequent health care use.

Methods

This observational cohort study was approved by the institutional review board at Sunnybrook Health Sciences Centre in Toronto, Ontario. Under Ontario's Personal Health Information Protection Act, the need for patient consent was waived.

Setting
Data were obtained from the Cardiac Care Network of Ontario, which is a network of 19 hospitals that provide adult cardiac services, and includes a clinical registry of patients who undergo cardiac angiography, percutaneous coronary intervention or coronary artery bypass grafting.[9,10] Its accuracy has been validated by retrospective chart review.[11,12] We linked data from the network to population-level administrative databases using unique, encoded identifiers and analyzed the data at the Institute for Clinical Evaluative Sciences.[13–16] See Appendix 1 (available at www.cmajopen.ca/content/4/3/E409/suppl/DC1) for details of the administrative databases.

Patients
The cohort consisted of patients who underwent angiography between Oct. 1, 2008, and Sept. 30, 2011, for the indication of stable coronary artery disease, and who had obstructive coronary stenosis. During this period, there were only 18 member hospitals in the Cardiac Care Network of Ontario. For patients who underwent angiography multiple times during the study period, we considered only the initial angiogram. We excluded patients who had a myocardial infarction within 90 days before the first angiogram, those with normal coronary arteries, those with mild coronary artery disease and patients with missing angiography data.

Exposure
We allocated patients who received revascularization within 90 days of their index angiogram to the revascularization strategy group (and into percutaneous coronary intervention or coronary artery bypass grafting subgroups), as is consistent with the literature and known procedural wait times,[10,11] and we allocated all remaining patients to the medical therapy strategy group.

Ratio of revascularization to medical therapy
We calculated the ratio of revascularization to medical therapy (referred to herein as the revascularization ratio), defined as the number of patients who received revascularization by the num-

ber of patients who underwent medical therapy. We then allocated the hospitals equally into 1 of 3 categories: high, medium, or low, based on equal tertiles of revascularization ratio.

Main outcomes
The primary outcome was the total cumulative cost per patient in the 1 year following the index angiography. Complete cost profiles were available for all patients for 1 year or until death. As such, we did not have to consider censored costs in our analyses. The categories of costs were all-cause physician visits and laboratory tests, acute care and chronic care hospital admissions, emergency department visits, same-day surgeries and coronary artery disease–related medication use for patients aged 65 years and older.[15,16]

We determined costs associated with physician visits and laboratory tests using data from the claims history of the Ontario Health Insurance Program database.[14] The database also included shadow billings from providers of organizations covered by alternate payment arrangements. We estimated the cost of hospital admission using the resource intensity weights method.[16] We multiplied the resource intensity weights associated with the case-mix group for each hospital admission in the Canadian Institute for Health Information Discharge Abstract Database by the average provincial cost per weighted case for all Ontario acute and chronic care hospitals for that year.[16] This method yields a mean cost per hospital admission for cases assigned to a particular case-mix group category. We used a similar resource intensity weights
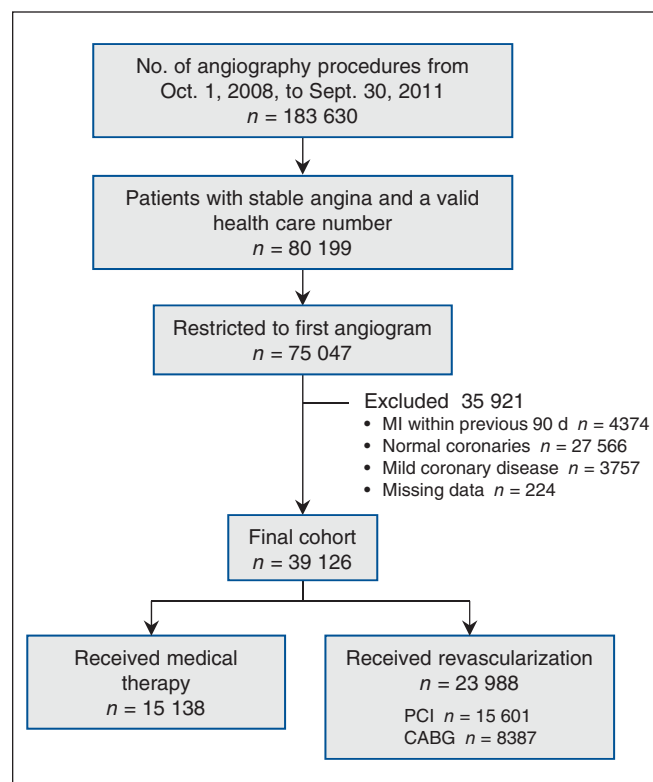


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No. of angiography procedures from
Oct. 1, 2008, to Sept. 30, 2011
n = 183 630
        ↓
Patients with stable angina and a valid
health care number
n = 80 199
        ↓
Restricted to first angiogram
n = 75 047
        ↓                Excluded  35 921
                         • MI within previous 90 d  n = 4374
                         • Normal coronaries  n = 27 566
                         • Mild coronary disease  n = 3757
                         • Missing data  n = 224
        ↓
Final cohort
n = 39 126
     ↓            ↓
Received medical       Received revascularization
therapy                n = 23 988
n = 15 138             PCI  n = 15 601
                       CABG  n = 8387
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Figure 1: Selection of patients for the study. Note: CABG = coronary artery bypass grafting, MI = myocardial infarction, PCI = percutaneous coronary intervention.

Table 1 (part 1 of 2): Baseline characteristics of patients with stable angina, by initial treatment strategy

Variable	% of patients*			p value (medical therapy v. revascularization)	% of patients*	
	Total n = 39 126	Medical therapy n = 15 138	Revascularization n = 23 988		PCI n = 15 601	CABG n = 8387
Patient-level factors						
Demographics						
Age, mean ± SD, yr	66.0 ± 10.3	67.0 ± 10.2	65.3 ± 10.3	< 0.001	65.0 ± 10.7	66.0 ± 9.7
Sex, male	75.3	74.3	75.9	< 0.001	72.9	81.3
Rural residence	14.5	14.4	14.5	0.7	14.6	14.5
Income quintile				< 0.001		
1 (lowest)	18.6	19.6	17.9		18.4	17.1
2	20.4	20.4	20.4		20.4	20.6
3	20.2	20.3	20.2		20.3	19.9
4	20.7	20.2	21.0		20.8	21.3
5 (highest)	20.1	19.4	20.5		20.2	21.1
Medical comorbidities						
PVD	9.4	11.5	8.1	< 0.001	7.6	9.0
Previous MI	28.1	35.8	23.3	< 0.001	24.8	20.4
COPD	6.9	8.6	5.8	< 0.001	6.1	5.1
Charlson Comorbidity Index score, mean ± SD	0.9 ± 1.3	1.1 ± 1.5	0.8 ± 1.2	< 0.001	0.7 ± 1.3	0.8 ± 1.2
Cardiac risk factors						
Diabetes	44.0	48.0	41.4	< 0.001	40.5	43.1
Hypertension	86.7	89.5	84.9	< 0.001	84.9	85.1
Hyperlipidemia	80.8	83.0	79.5	< 0.001	79.9	78.7
History of smoking	31.6	33.2	30.5	< 0.001	30.3	31.0
Cardiac status/testing						
Native stenosis†						
LM	13.0	10.8	14.4	< 0.001	5.5	31.0
Proximal LAD	33.2	28.7	36.0	< 0.001	29.7	47.6
Mid/distal LAD	49.6	47.5	51.0	< 0.001	46.0	60.3
Circumflex	51.5	50.9	51.9	0.07	43.6	67.2
RCA	60.8	60.5	60.9	0.4	54.7	72.6
Had previous CABG				< 0.001		
Yes	18.0	30.1	10.4		15.1	1.6
No	81.9	69.9	89.5		84.9	98.2
LV function				< 0.001		
≤ 34%	5.4	8.4	3.5		3.3	4.0
35%–49%	12.9	16.0	11.0		10.6	11.7
≥ 50%	48.6	46.5	50.0		49.7	50.5
NA	33.0	29.1	35.5		36.4	33.8
Exercise ECG risk				< 0.001		
High risk	27.7	21.3	31.7		28.8	37.1
Low risk	22.4	22.9	22.2		23.0	20.7
Uninterpretable	4.9	4.8	4.9		5.3	4.2
NA	45.0	51.1	41.2		42.9	38.0

	% of patients*			*p* value (medical therapy v. revascularization)	% of patients*	
Variable	Total *n* = 39 126	Medical therapy *n* = 15 138	Revascularization *n* = 23 988		PCI *n* = 15 601	CABG *n* = 8387
Patient-level factors cont'd						
Cardiac status/testing cont'd						
Functional imaging risk				< 0.001		
High risk	32.0	31.2	32.6		31.1	35.3
Low risk	23.0	25.1	21.7		23.2	19.1
Unknown/NA	44.9	43.7	45.7		45.7	45.7
CCS class				< 0.001		
0	16.5	22.0	13.0		11.3	16.2
1	14.0	15.9	12.8		12.3	13.8
2	38.3	35.5	40.0		40.8	38.5
3	28.5	24.2	31.1		32.3	29.0
4	2.8	2.4	3.0		3.3	2.5
Physician-level factors						
Referral physician				0.01		
Family physician	25.7	26.1	25.5		25.6	25.3
Cardiology	41.4	40.5	14.9		42.1	41.6
Internal medicine	9.4	9.3	9.6		9.1	10.4
Other	6.6	6.8	6.5		6.2	7.0
Missing	16.9	17.4	16.5		17.0	15.6
Hospital-level factors						
Annual no. of catheterization procedures, mean ± SD	4092.3 ± 1696.4	4031.3 ± 1684.3	4130.9 ± 1702.9	< 0.001	4120.9 ± 1702.6	4149.5 ± 1703.6
Hospital type				< 0.001		
Catheterization only	13.2	13.6	13.0		13.4	12.2
PCI and catheterization only	6.1	7.2	5.4		5.0	6.1
CABG, PCI and catheterization	80.8	79.3	81.7		81.7	81.8

CABG = coronary artery bypass grafting, Cath = catheterization, CCS = Canadian Cardiovascular Society, COPD = chronic obstructive pulmonary disease, ECG = electrocardiogram, LAD = left anterior descending, LM = left main, LV = left ventricular, MI = myocardial infarction, NA = not done, PCI = percutaneous coronary intervention, PVD = peripheral vascular disease, RCA = right coronary artery.
*Unless stated otherwise.
†LM if ≥ 50% stenosis, proximal LAD if ≥ 70% stenosis, mid/distal LAD if ≥ 70% stenosis, circumflex if ≥ 70% stenosis, RCA if ≥ 70% stenosis.

Table 1 (part 2 of 2): Baseline characteristics of patients with stable angina, by initial treatment strategy

method to determine the costs for emergency department visits and same-day surgeries, both using the National Ambulatory Care Reporting System database. We adjusted costs to 2013 Canadian dollars using the consumer price index.

Statistical analyses

We used hierarchical generalized linear models, with a logarithmic link and γ distribution. The models incorporated hospital-specific random effects to account for within-hospital homogeneity in outcomes. The logarithmic link function is advantageous because it restricts predicted costs to positive values. In addition, final model coefficients are straightforward to interpret; specifically, the exponential of the coefficient provides a cost ratio, or the relative increase in the mean cost for a one unit change in the predictor variable. We used the γ distribution because of the skewed distribution of health care costs.[17] Our models included 2 main covariates of interest: the treatment allocation (medical v. percutaneous coronary intervention v. coronary artery bypass grafting) and the revascularization ratio (high v. medium v. low). In addition, the models included an interaction between treatment allocation and revascularization ratio. We adjusted the models for patient, physician and hospital factors, including patient demographics, cardiac morbidities, risk factors, diagnostic test results, coronary anatomy,
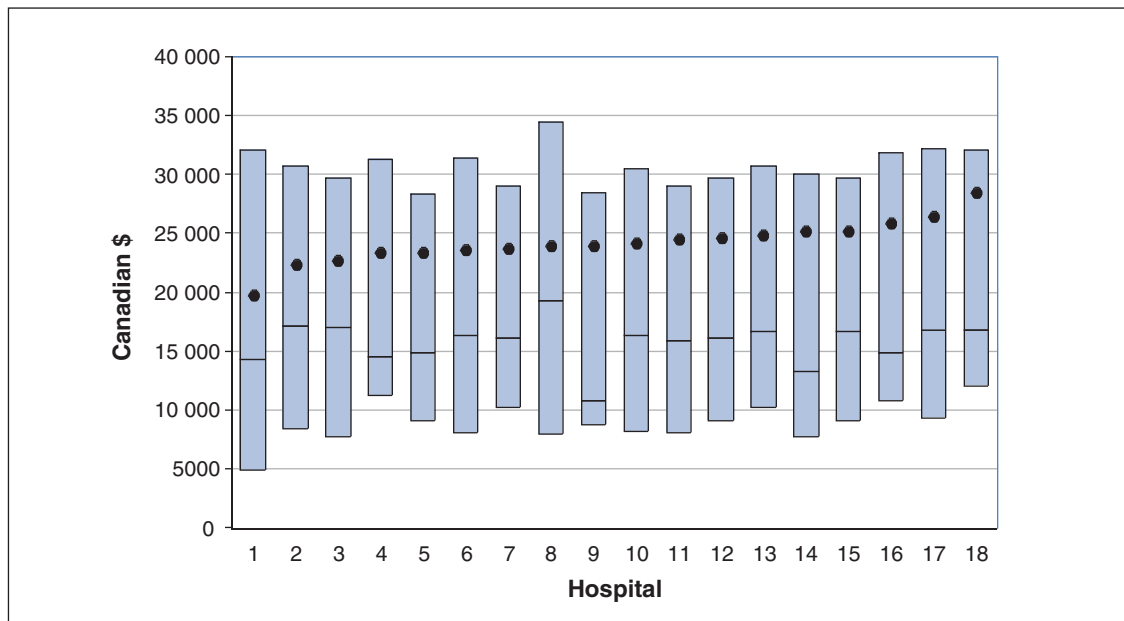
Figure 2: Variation in individual- and hospital-level costs. The median is plotted for each centre as a horizontal line, the boxes represent the interquartile range, and the circles represent the mean.

Table 2: Components of 1-year mean costs						
	Cost, $			*p* value (medical therapy v. revascularization)	Cost, $	
Category	Total	Medical	Revascularization		CABG	PCI
Acute care hospital admission	11 373	7038	14 109	< 0.001	25 927	7755
Emergency department	372	367	375	0.3	403	361
Surgery	2691	2090	3071	< 0.001	1901	3699
Physician visits	5449	4079	6313	< 0.001	10 086	4284
Medication*	1810	1857	1780	0.004	1476	1944
Laboratory	194	195	193	0.3	217	180
Long-term care	54	93	29	< 0.001	47	19

Note: CABG = coronary artery bypass grafting, PCI = percutaneous coronary intervention.
*For patients > 65 years of age.

referral physician specialization and hospital catheterization volume. We used SAS Version 9.3 for all analyses.

Results

Patients
Between Oct. 1, 2008, and Sept. 30, 2011, a total of 183 630 angiography procedures were performed in Ontario. The final cohort included 39 126 patients with stable coronary artery disease, of which 15 138 received medical treatment and 23 988 received revascularization (percutaneous coronary intervention: 15 601 patients; coronary artery bypass grafting: 8387 patients; Figure 1). There were substantial differences in the baseline characteristics between medical therapy and revascularization groups (Table 1); patients who received medical treatment were

older, more likely to be female, had greater comorbidity and had less severe symptoms of angina based on the classification of the Canadian Cardiovascular Society.

Revascularization ratio
The average revascularization ratio across the 18 Ontario hospitals was 1.58, ranging from 1.09 to 2.31 (Appendix 1 [Appendix Figure 1]).

Variation in cumulative 1-year health care cost
Individual patient 1-year cost varied substantially (interquartile range $8235–$30 511). As seen in Figure 2, the overall cost was heavily skewed, with an overall median of $15 707 and overall mean of $24 026. The mean costs for medical and revascularization treatments were $18 069 (median $7867) and

$27 786 (median $21 428), respectively. The mean cost by hospital ranged from $19 749 to $28 473.

Components of health care costs

Most health care costs were due to acute care hospital admission, with a significantly higher cost for patients undergoing revascularization than for patients receiving medical therapy (Table 2). This was primarily driven by the cost of coronary artery bypass grafting.

Predictors of health care costs

The results of the fully adjusted model are found in Table 3. With respect to our 2 primary covariates of interest, there was no significant difference in cost associated across the tertiles of hospital revascularization ratio. In contrast, revascularization was a significant predictor of mean cost regardless of the modality (percutaneous coronary intervention: cost ratio 1.27, 95% confidence interval [CI] 1.24–1.31; coronary artery bypass grafting: cost ratio 2.62, 95% CI 2.53–2.71).

In addition, sex was a statistically significant predictor of mean cost, with a cost ratio of 0.96 (95% CI 0.95–0.98) for men, indicating that the mean per-patient cost was 4% less for men than for women (Table 3). Peripheral vascular disease (cost ratio 1.25, 95% CI 1.21–1.28), hypertension (cost ratio 1.11, 95% CI 1.08–1.13), and higher Charlson score (cost ratio 1.17, 95% CI 1.16–1.17) were associated with higher mean cost. Previous cardiac surgery was associated with a 17% reduction in mean cost. Symptom severity, as measured by the Canadian Cardiovascular Society class, had an impact on mean cost, with more symptomatic patients, in general, having a lower mean cost. The specialty of the referral physician was a predictor of cost, with patients who were referred by either cardiologists or other physicians having a higher 1-year cumulative cost than those referred by family physicians. In general, busier hospitals (as measured by their annual cardiac catheterization volume) had lower cost, although the magnitude of this effect was small.

In our interaction model (Appendix 1 [Appendix Table 1]), we were able to compare the effect of each initial strategy on total costs, stratified by the type of hospital (low, medium or high revascularization ratio). We found that, on average, there was no difference in cumulative 1-year health care cost among patients who received medical treatment compared with those undergoing revascularization at the different strata defined by the hospital revascularization ratio. Similarly, patients who initially received percutaneous coronary intervention had similar costs at hospitals with high versus medium versus low revascularization ratios, as did patients who received coronary artery bypass grafting.

Interpretation

We found significant variation in 1-year cumulative health care costs among patients with stable coronary artery disease who received treatment at different hospitals. Greater patient comorbidity and treatment with revascularization were associated with higher cost. Importantly, the variation observed between hospitals based on revascularization ratio was not associated with a significant difference in cumulative

Table 3 (part 1 of 2): Predictors of 1-year cumulative health care costs

Covariate	Cost ratio (95% CI)
Treatment *	
Medical management	Reference
PCI	1.27 (1.24–1.31)
CABG	2.62 (2.53–2.71)
Patient-level factors	
Demographic characteristics	
Age, yr	1.01 (1.01–1.01)
Sex, male	0.96 (0.95–0.98)
Rural residence	0.97 (0.95–0.99)
Income quintile	
5 (highest)	Reference
1 (lowest)	1.10 (1.07–1.12)
2	1.04 (1.02–1.07)
3	1.02 (1.00–1.05)
4	1.02 (1.00–1.05)
Medical comorbidities	
Peripheral vascular disease	1.25 (1.21–1.28)
Previous MI	0.95 (0.93–0.97)
COPD	1.10 (1.07–1.13)
Charlson score	1.17 (1.16–1.17)
Cardiac risk factors	
Diabetes	1.00 (0.99–1.02)
Hypertension	1.11 (1.08–1.13)
Hyperlipidemia	0.95 (0.93–0.97)
History of smoking	1.00 (0.99–1.02)
Cardiac status/testing	
Native stenosis†	
LM	1.12 (1.09–1.15)
Proximal LAD	1.10 (1.08–1.11)
Mid/distal LAD	1.08 (1.06–1.09)
Circumflex	1.11 (1.09–1.12)
RCA	1.09 (1.07–1.11)
Previous CABG	0.83 (0.82–0.85)
LV function, %	
≥ 50	Reference
35–49	1.03 (1.00–1.05)
≤ 34	1.14 (1.10–1.18)
NA	0.95 (0.93–0.97)

Table 3 (part 2 of 2): Predictors of 1-year cumulative health care costs	
Covariate	Cost ratio (95% CI)
Patient-level factors cont'd	
Cardiac status/testing cont'd	
Exercise ECG risk	
Low risk	Reference
High risk	1.04 (1.02–1.06)
Uninterpretable	1.09 (1.05–1.14)
NA	1.24 (1.21–1.27)
Functional imaging risk	
Low risk	Reference
High risk	1.01 (0.99–1.03)
Unknown/NA	1.05 (1.03–1.08)
CCS class	
0	Reference
1	0.90 (0.87–0.92)
2	0.88 (0.85–0.90)
3	0.90 (0.88–0.92)
4	0.86 (0.82–0.90)
Physician factors	
Referral physician	
Family physician	Reference
Cardiology	1.02 (1.01–1.05)
Internal medicine	1.00 (0.98–1.03)
Other	1.22 (1.19–1.27)
Missing	1.03 (1.00–1.05)
Hospital factors	
Hospital revascularization ratio*	
Low	Reference
Medium	1.03 (0.93–1.15)
High	1.08 (0.97–1.21)
Annual catheterization volume	0.99 (0.99–0.99)

Note: CABG = coronary artery bypass grafting, CI = confidence interval, COPD = chronic obstructive pulmonary disease, ECG = electrocardiography, LAD = left anterior descending, LM = left main, LV = left ventricular, MI = myocardial infarction, NA = not done or missing, PCI = percutaneous coronary intervention, RCA = right coronary artery.
*The 2 main covariates of interest: treatment type and hospital revascularization ratio.
†LM if ≥ 50% stenosis, proximal LAD if ≥ 70% stenosis, mid/distal LAD if ≥ 70% stenosis, circumflex if ≥ 70% stenosis, RCA if ≥ 70% stenosis.

health care costs, regardless of the management strategy.

It has previously been reported that the direct cost of stable coronary artery disease accounted for 1.3% of UK national health expenditures.[18] The vast majority of this cost was related to revascularization procedures (35% of cost) and hospital bed occupancy (31% of cost). Additionally, drug treatment accounted for 12% of total expenditures. Similar findings were found in several other UK and European studies.[19,20]

In our study, the major driver for 1-year cumulative costs was the receipt of revascularization. If revascularization offers no impact on mortality and if symptom relief is equivocal, as previous randomized controlled trials have shown, then our study suggests that the decision to pursue a revascularization strategy will translate into a substantial impact on health care resources. It follows that revascularization in patients with minimal symptoms in whom clinical benefit may be marginal may concurrently place an important financial burden on the health care system. This reinforces the importance of appropriate selection of patients who should receive percutaneous coronary intervention or coronary artery bypass grafting. Interestingly, the cumulative cost for each of the treatment strategies did not vary with hospital revascularization ratio — that is, the cost of a strategy was similar regardless of the tendencies of the site to favour revascularization or medical management. This implies a similar degree of efficiency for hospitals at different revascularization ratio strata, which is a reassuring finding. We also identified a number of patient-level factors that were associated with increased health care costs, including sex and previous coronary artery bypass grafting. We can only hypothesize as to the reasons for these findings. Regarding sex, men may have less health-seeking behaviour, which translated into a small difference in overall costs. For patients with previous coronary artery bypass grafting, we anticipate that these patients were more likely to be treated medically or by percutaneous coronary intervention rather than redoing surgery, resulting in lower overall costs.

Limitations

Our findings should be interpreted in the context of several limitations. First, this study did not take on a societal perspective, but rather that of the third-party payer for the province. Therefore, we excluded some potential costs, such as patient out-of-pocket and lost-productivity costs,[19] and medication costs for patients younger than 65 years, as Ontario only provides comprehensive prescription drug coverage for patients 65 years of age or older. As such, total costs are skewed toward older patients. However, given that most patients in our cohort were over 65 years of age and, importantly, the bulk of costs were nonmedication related, this would not have made a qualitative difference in our conclusions. Second, there were substantial differences in patients who received medical treatment versus revascularization. Patients who received medical treatment were older, and were more likely to be female and have greater comorbidity. This may suggest that patients who receive medical treatment are more complex and more likely to be at higher risk of morbidity and mortality. Third, we were limited to evaluating covariates that were captured in the databases available. Other factors may have influenced patient costs. For example, aspects of physician and hospi-

tal culture may have influenced patients' treatment strategy and, therefore, costs. Fourth, our cohort was accrued from 2008 to 2011, which was the most recent data available at the time of our study. We acknowledge the data are more than 5 years old; however, the interventions and practice patterns studied here are well-established, and we do not expect that more recent data would be significantly different because care for these patients has not changed. Fifth, based on our allocation of treatment strategy, there is a risk of survivorship bias, in that patients who died within 90 days were allocated to the medical-therapy group and thus have lower costs. This risk is mitigated by the fact that our cohort was a stable coronary artery disease population with very low mortality — indeed, our previous work showed a 90-day mortality of less than 1%.[21] Finally, we limited our analyses to health care costs over a restricted 1-year time horizon in a cohort of patients after coronary angiography. As such, our results cannot be generalized to stable patients who have not undergone angiography. The use of a short time horizon may bias results against coronary artery bypass grafting, because it is associated with fewer revascularizations in the long term. However, these long-term costs would be discounted and therefore have a substantially smaller effect on overall costs.

Conclusion

Most costs associated with stable coronary artery bypass grafting were due to acute care hospital admission, with the primary driver being revascularization. Our study highlights the resource implications of an initial revascularization strategy.

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Affiliations: Division of Cardiology (Kang, Bennell, Ko, Wijeysundera), Sunnybrook Health Sciences Centre, Schulich Heart Centre, University of Toronto; Institute for Clinical Evaluative Sciences (Qiu, Austin, Ko, Wijeysundera), Toronto, Ont.; Libin Cardiovascular Institute of Alberta (Knudtson), University of Calgary, Calgary, Alta.; Institute of Health Policy, Management and Evaluation (Austin, Ko, Wijeysundera), University of Toronto, Toronto, Ont.