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Original Article

Racial Disparities in Acute Coronary Syndrome Management Within a Universal Healthcare Context: Insights From the AMI-OPTIMA Trial

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ABSTRACT

Background: Although prior studies have demonstrated racial disparities regarding acute coronary syndrome (ACS) care within private or mixed healthcare systems, few researchers have explored such disparities within universal healthcare systems. We aimed to evaluate the quality and outcomes of in-hospital ACS management for White patients vs patients of colour, within a universal healthcare context.

Methods: We performed a post hoc analysis of the Acute Myocardial Infarction - Knowledge Translation to Optimize Adherence to Evidence-Based Therapy study, a cluster-randomized trial evaluating a knowledge-translation intervention at 24 hospitals in Quebec,

RÉSUMÉ

Contexte : Bien que des études antérieures aient démontré l'existence de disparités raciales dans la prise en charge du syndrome coronarien aigu (SCA) au sein de systèmes de santé privés ou mixtes, peu de chercheurs ont étudié ces disparités au sein de systèmes universels de soins de santé. Nous avons cherché à évaluer la qualité et les résultats de la prise en charge du SCA à l'hôpital pour les patients blancs par rapport aux patients de couleur, dans un contexte de soins de santé universels.

Méthodologie : Nous avons effectué une analyse a posteriori de l'étude AMI-OPTIMA, un essai sur échantillon en grappes aléatoire évaluant une intervention d'application des connaissances dans 24

Percutaneous coronary intervention (PCI) and evidence-based medical therapy (EBMT) are proposed indicators of optimal in-hospital management and can improve long-term outcomes of patients with acute coronary syndromes (ACSs).[1,2] Previously, investigators have shown that racial/ethnic minorities, particularly Black patients, were less likely to receive optimal ACS care in private or mixed healthcare systems.[3-5] Compared to White patients with ACS, patients of colour with ACS underwent less coronary catheterization and had EBMT prescribed less often at discharge.[6,7] They also had more major adverse cardiac events.[3-5] It remains unclear whether similar disparities exist within a universal healthcare system.

A few prior Canadian studies have identified racial/ethnic differences in short-term mortality and revascularization.[8,9]

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Ethics Statement: The study investigators obtained ethical approval for the original trial from the McGill University Hospital Centre (coordinating hospital) and all other participating institutions. As there was no direct contact with patients, the central ethics board waived the requirement for informed consent.

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Canada (years: 2009 and 2012). The primary endpoint was coronary catheterization. The secondary endpoints included in-hospital mortality, percutaneous and surgical coronary revascularization, major bleeding, total stroke, and discharge prescription of evidence-based medical therapy.

Results: Of 3444 included patients, 2738 were White, and 706 were people of colour. The mean age was 68.2 years (33.3% women) among White patients and 69.5 years (36.0% women) among patients of colour. Patients of colour were less likely to undergo in-hospital coronary catheterization than were White patients (74.5% vs 80.3%, $P = 0.001$). This difference was attenuated after adjusting for patient-level characteristics (odds ratio 0.89; 95% confidence interval 0.73-1.09), and it was eliminated after adjusting for hospital-level characteristics (odds ratio 1.04; 95% confidence interval 0.73-1.49).

Conclusions: Racial disparity in coronary catheterization for ACS persists within a universal healthcare context. Patients' comorbidities and hospital-level factors may be partially responsible for this inequality. Future research on cardiovascular healthcare in patients with diverse racial/ethnic backgrounds in universal healthcare systems is needed to remediate racial inequality in ACS management.

hôpitaux du Québec, au Canada (années : 2009 et 2012). Le paramètre d'évaluation principal était le cathétérisme coronaire. Les paramètres d'évaluation secondaires comprenaient la mortalité à l'hôpital, la revascularisation coronaire percutanée et chirurgicale, l'hémorragie majeure, l'accident vasculaire cérébral et la prescription au congé d'un traitement médical fondé sur des données probantes.

Résultats : Sur les 3444 patients étudiés, 2738 étaient blancs et 706 étaient des personnes de couleur. L'âge moyen était de 68,2 ans (33,3 % de femmes) chez les patients blancs, et de 69,5 ans (36,0 % de femmes) chez les patients de couleur. Les patients de couleur étaient moins susceptibles de subir un cathétérisme coronaire à l'hôpital que les patients blancs (74,5 % contre 80,3 %, $p = 0{,}001$). Cette différence a été atténuée après ajustement pour tenir compte des caractéristiques des patients (rapport de cotes : 0,89; intervalle de confiance [IC] à 95 % : 0,73-1,09), et éliminée après ajustement pour tenir compte des caractéristiques des hôpitaux (rapport de cotes : 1,04; IC à 95 % : 0,73-1,49).

Conclusions : La disparité raciale en ce qui a trait au cathétérisme coronaire pour un SCA persiste dans un contexte de soins de santé universels. Les comorbidités des patients et des facteurs liés à l'hôpital peuvent être partiellement responsables de cette inégalité. De plus amples recherches sur les soins cardiovasculaires chez les patients de diverses origines raciales ou ethniques dans les systèmes universels de soins de santé sont nécessaires pour remédier aux inégalités raciales dans la prise en charge du SCA.

However, these studies focused on Asian patients, and thus do not reflect the rich racial diversity of the Canadian population. These studies also have not evaluated discharge prescriptions of EBMT or explored the factors underlying the decision to not pursue coronary catheterization.[8,9]

Investigators have proposed several hypotheses to explain the racial disparities in ACS management and outcomes in private and mixed healthcare settings. These include differences in hospital PCI capacity, unequal burdens of comorbidities, cross-cultural communication barriers, financial inequality, and systemic racism.[3,10-12] However, the bulk of the existing data was derived mainly from the US healthcare system, in which socioeconomic status and insurance coverage may influence cardiovascular care quality.[13,14]

Within a universal healthcare system, such as the one in Canada, the impact of race/ethnicity on the quality of in-hospital management and outcomes may be less confounded by socioeconomic inequality.[15,16] Therefore, we leveraged data from the **A**cute **M**yocardial **I**nfarction - Knowledge Translation to **Optim**ize **A**dherence to Evidence-Based Therapy (AMI-OPTIMA) study to examine whether there are any racial disparities in invasive cardiac evaluation and treatment strategy, discharge prescription of EBMT, or major adverse outcomes for patients hospitalized for ACS in Quebec, Canada.

Methods

Population and study design

We performed a post hoc analysis of data from the AMI-OPTIMA trial (ClinicalTrials.gov NCT02672137). In brief, the AMI-OPTIMA trial was a cluster randomized controlled trial that evaluated the impact of a knowledge translation (KT) intervention vs standard management on the discharge prescription of EBMT for patients with ACS at 24 hospitals in Quebec, Canada (during the years 2009 and 2012).[17] For each participating hospital, we reviewed the baseline discharge EBMT provided to 100 consecutive patients in 2009. Hospitals were then ranked and grouped into quartiles based on the quality of their discharge EBMT. The hospitals were subsequently randomized (within their quartile) to either the KT intervention or standard management. The KT intervention included a 1-year multipronged approach with educational sessions, focus groups, continuous quality control, and opinion leaders. We evaluated the impact of KT by examining the discharge EBMT of 100 consecutive patients hospitalized for ACS at all 24 hospitals in 2012. There was no notable impact of KT on the discharge prescription of EBMT.[17] Of note, only 11 of the 24 participating hospitals were PCI-capable hospitals.

The study investigators obtained ethical approval for the original trial from the McGill University Hospital Centre (coordinating hospital) and all other participating institutions. As there was no direct contact with patients, the central ethics board waived the requirement for informed consent.

Selection of patients

To obviate potential selection bias, we excluded all patients whose first hospital of presentation was not one of the 24 AMI-OPTIMA hospitals—that is, transferred-in patients. Patients from outside the AMI-OPTIMA hospital network are often transferred into the network solely for coronary catheterization, and we do not have information on all patients with ACS from these outside institutions. We excluded patients whose hospitalization duration was less than 48 hours (mainly transferred-out patients with incomplete in-hospital data). For the endpoint of discharge EBMT, we excluded patients who died during the index hospitalization for ACS.

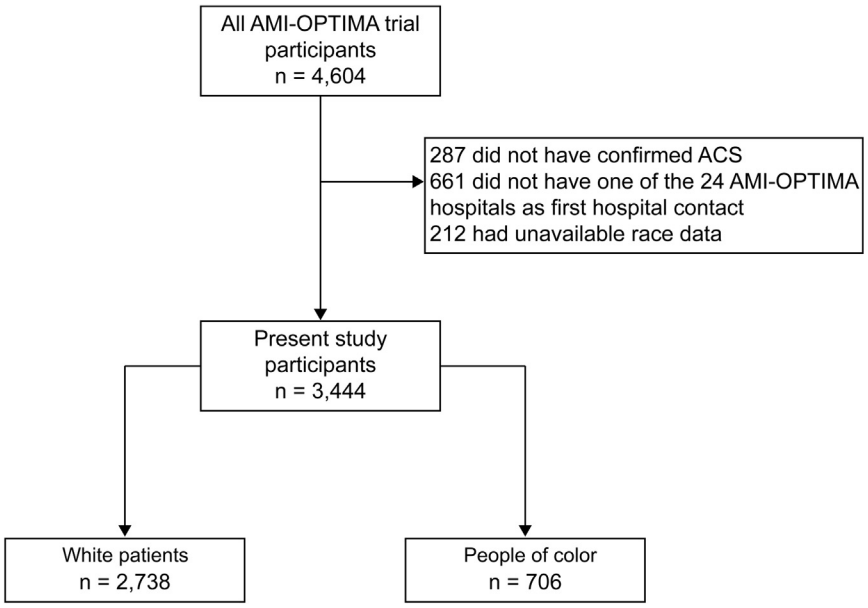

Figure 1. Study population and reasons for exclusion. ACS, acute coronary syndrome; AMI-OPTIMA, **A**cute **M**yocardial **I**nfarction - Knowledge Translation to **Optim**ize **A**dherence to Evidence-Based Therapy.

Racial identification

First, the local research teams determined race through medical record review. Race was self-identified by the patients and explicitly noted in the hospital charts. When race information was not available through medical review, we analyzed surnames to identify patients of South Asian and Chinese ethnicity (n = 114 patients; 3.3% of the included patients).[18] We further excluded all patients whose first hospital of presentation was one of the AMI-OPTIMA hospitals and who did not have available racial-specific data or non−South Asian/Chinese surnames (n = 212; 4.6% of the initial cohort). We then dichotomized patients as being either White or a person of colour.

All research coordinators received standardized training on identification of race by medical records and surname analysis. In cases of doubt, they were instructed to contact the coordinating centers for assistance in racial identification.

Main Endpoints

The primary endpoint was in-hospital coronary catheterization. The 7 secondary endpoints were in-hospital all-cause mortality, coronary artery bypass graft (CABG) surgery, PCI, coronary revascularization (CABG and PCI combined), thrombolysis in myocardial infarction (TIMI) major bleeding, total stroke (ischemic and hemorrhagic), and discharge prescription of EBMT. EBMT was defined as the prescription of all the following medications: dual-antiplatelet therapy, statin, and beta-blockers (unless there was a documented contraindication or patient refusal). Finally, for a more in-depth understanding of the potential reasons for a lack of catheterization, we further categorized the reason for no coronary catheterization as one of the following: (i) healthcare provider decision; (ii) patient- or family-led decision; or (iii) death before coronary catheterization.

Statistical analysis

We presented continuous data with normal distribution as means with standard deviations and used the Student *t* test for analysis. Non-normal data were presented as medians with interquartile ranges and were compared using the Wilcoxon rank-sum test. We performed χ^2 and Fisher's exact test tests for dichotomous variables. Approximately 3% of admission hemoglobin levels, 1% of admission creatinine levels, and 1% of age data were missing. We used multiple imputation to generate these missing values. We obtained complete data for the primary and secondary endpoints. We used a significance level of 0.05 and 2-sided tests to compare baseline characteristics.

We constructed 3 sequential inverse probability-of-treatment weighting (IPTW) models for each endpoint.[19] We chose IPTW to avoid overfitting with our secondary endpoints and to estimate the average association between race and the endpoints for the entire study population.[20] The propensity scores estimated the probability of being in the White patient group vs the patients of colour group and were modelled using logistic regression with included confounders based on a priori subject matter knowledge. Model 1 included only age and sex. For model 2, we added the following 11 patient-level confounders: dyslipidemia, hypertension, diabetes, smoking status, prior PCI, prior CABG surgery, prior cerebrovascular accident/transient ischemic attack, creatinine value at admission, hemoglobin value at admission, presentation with ST-segment elevation myocardial infarction (STEMI), and year of hospitalization. For the secondary endpoints, except for CABG surgery and PCI, we further adjusted for in-hospital PCI and CABG surgery. To account for clustering at the hospital level, we further expanded model 2 with indicator variables for admission at a PCI-capable center and the KT variable in the IPTW model along with a multilevel model.[21] For the latter, we used a mixed model

Table 1. Baseline clinical characteristics and in-hospital management

Variables	White patients (n = 2738)	Patients of colour (n = 706)	*P*
Demographics and comorbidities			
Age, y, mean (SD)	68.2 (13.7)*	69.5 (14.4)	0.03
Female sex	911 (33.3)	254 (36.0)	0.18
Dyslipidemia	1603 (58.5)	354 (50.1)	< 0.0001
Hypertension	1745 (63.7)	463 (65.6)	0.36
Diabetes mellitus	753 (27.5)	226 (32.0)	0.02
Current smoker	745 (27.2)	155 (22.0)	0.005
Prior PCI	608 (22.2)	143 (20.3)	0.26
Prior CABG	233 (8.5)	66 (9.3)	0.48
Prior CVA/TIA	94 (3.4)	20 (2.8)	0.43
Peptic ulcer disease	112 (4.1)	20 (2.8)	0.12
Liver disease†	78 (2.8)	20 (2.8)	0.98
Admission creatinine, umol/L, median (IQR)	88.4 (70.7−106.1)*	88.4 (70.7−115.0)‡	0.77
Admission Hb level (g/L) − median (IQR)	138 (123−150)*	134 (119−146)*	< 0.0001
Clinical presentation			
Hospitalization in 2012	1417 (52.8)	403 (57.1)	0.01
STEMI	819 (29.9)	173 (24.5)	0.005
NSTEMI	1240 (45.3)	336 (47.6)	0.27
Unstable angina	679 (24.8)	197 (27.9)	0.09
Admission at a PCI-capable center	1081 (40.1)	181 (26.1)	< 0.0001
In-hospital medications for treatment of ACS			
Fibrinolysis, n (% of STEMI)	20 (2.4)	3 (1.7)	0.60
ASA	2656 (97.0)	687 (97.3)	0.67
P2Y12 inhibitor	2460 (89.8)	612 (86.7)	0.02
Intravenous unfractionated heparin	2271 (82.9)	558 (79.0)	0.02
Low−molecular weight heparin	847 (30.9)	280 (39.7)	< 0.0001
Glycoprotein IIb/IIIa inhibitors	549 (20.1)	115 (16.3)	0.02

Values are n (%), unless otherwise indicated.

ACS, acute coronary syndrome; ASA, aspirin; CABG, coronary artery bypass surgery; CVA/TIA, cerebrovascular accident/transient ischemic attack; IQR, interquartile range; NSTEMI, non-ST-segment elevation myocardial infarction; PCI, percutaneous coronary intervention; SD, standard deviation; STEMI, ST-segment elevation myocardial infarction

*Approximately 1% of missing data.

†Liver disease was defined as a prior diagnosis of cirrhosis.

‡Approximately 3% of missing data.

with random slopes and intercepts to allow each hospital to have a different effect on the probability of coronary catheterization and to account for the variability of White patients and patients of colour at each hospital. We further examined whether there was any difference in cardiac catheterization between the subgroups with STEMI vs non-ST-elevation

Table 2. Procedural characteristics

Variables	White patients (n = 2738)	People of colour (n = 706)	*P*
Coronary catheterization and clinical presentation			
Coronary catheterization total	2199 (80.3)	526 (74.5)	0.001
Coronary catheterization for STEMI, n (% of STEMI)	736 (89.9)	159 (91.9)	0.48
Coronary catheterization for NSTE-ACS, n (% of NSTE-ACS)	1463 (76.2)	367 (68.9)	0.001
Arterial access site, n (% of cardiac catheterization)*			
Femoral access	730 (33.2)	168 (31.9)	0.45
Radial access	1423 (64.7)	337 (64.1)	
Brachial access	5 (0.2)	0	
Procedural details			
PCI	1597 (58.3)	367 (52.0)	0.002
DES, n (% of PCI)	543 (34.0)	125 (34.1)	0.20
BMS, n (% of PCI)	924 (57.9)	213 (58.0)	0.07
DES and BMS, n (% of PCI)	50 (3.1)	15 (4.1)	0.60
Number of stents (PCI patients), median (IQR)	1 (0-2)	1 (0-1)	0.01
Intra-aortic balloon pump	93 (3.4)	26 (3.7)	0.71
In-hospital CABG	243 (8.9)	49 (6.9)	0.10
In-hospital revascularization (CABG and PCI)	1811 (66.1)	411 (58.2)	< 0.0001

Values are n (%), unless otherwise indicated.

BMS, bare-metal stent; CABG, coronary artery bypass graft; DES, drug-eluting stent; IQR, interquartile range; NSTE-ACS, non-ST-segment elevation acute coronary syndrome; PCI, percutaneous coronary intervention; STEMI, ST-segment elevation myocardial infarction.

*Approximately 1% of missing data.

Table 3. Comparison of coronary catheterization use

Variables	White patients	Patients of colour	Unadjusted	Model 1	Model 2	Model 3
All ACS	n = 2.738	n = 706				
Coronary catheterization	2199 (80.3)	526 (74.5)	0.72 (0.59−0.87)	0.80 (0.66−0.98)	0.89 (0.73−1.09)	1.04 (0.73−1.49)
STEMI	n = 819	n = 173				
Coronary catheterization	736 (89.9)	159 (91.9)	1.28 (0.73−2.4)	1.5 (0.81−2.8)	1.56 (0.84−2.9)	1.78 (0.51−6.22)
NSTE-ACS	n = 1919	n = 533				
Coronary catheterization	1463 (76.2)	367 (68.9)	0.69 (0.56−0.85)	0.76 (0.61−0.94)	0.83 (0.67−1.03)	0.96 (0.66−1.40)

Values are n (%) or odds ratio (95% confidence interval), unless otherwise indicated.

ACS, acute coronary syndrome; NSTE-ACS, non-ST-segment elevation acute coronary syndrome; STEMI, ST-segment elevation myocardial infarction.

acute coronary syndrome (NSTE-ACS) using all 3 models while excluding presentation with STEMI as a covariate in models 2 and 3. Fisher's exact test with a 2-sided significance level of 0.05 was used for multigroup comparisons of the reasons for there being no catheterization.

We calculated standardized differences for each IPTW model to assess balance in included baseline covariates. In addition, we applied weight stabilization.[19] We presented the results as odds ratios and 95% confidence intervals. Robust standard errors were used to avoid biased estimates by inverse probability weighting and clustering. We conducted statistical analyses using SPSS version 26 (IBM Corp., Armonk, NY) and R version 4.0.2 (R Core Team, Vienna, Austria).

Results

A total of 4604 participants were included in the AMI-OPTIMA trial. After exclusion, there were 2738 White patients and 706 patients of colour (Fig. 1). The latter were older, and they had more diabetes mellitus, less dyslipidemia, less active smoking, and lower baseline hemoglobin than the White patients (Table 1). Furthermore, there were fewer STEMIs in the patients-of-colour group, and they presented less frequently to PCI-capable hospitals than did White patients (Table 2).

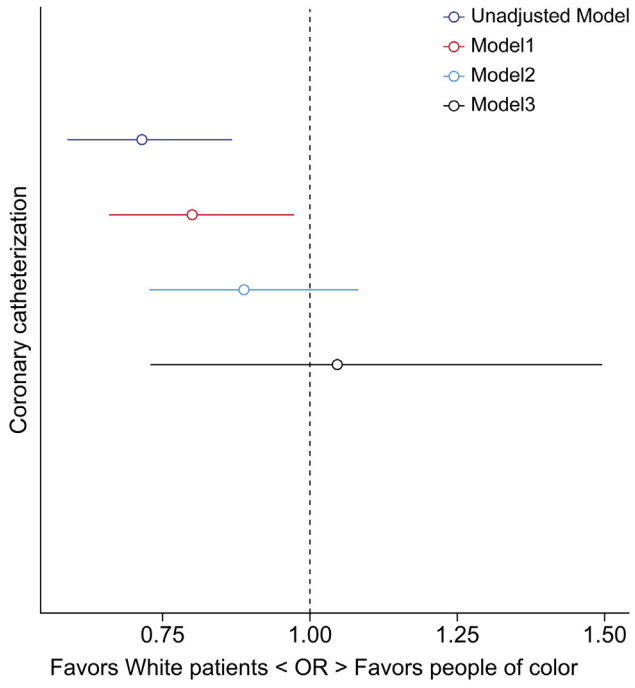

Figure 2. Unadjusted and adjusted odds ratios (OR) for coronary catheterization.

We presented the results related to our primary endpoint of coronary catheterization in Table 3. We ensured adequate balance for known potential confounders between the 2 groups with our IPTW model, as all mean standardized differences were < 0.1 (Supplemental Figs. S1-S3). Patients of colour were less likely to undergo coronary catheterization than were White patients (74.5% vs 80.3%, $P = 0.001$) prior to adjustment. This difference was progressively attenuated after adjustment for age and sex (Table 3, model 1) and for additional patient-level clinical characteristics (Table 3, model 2). The remaining differences were attenuated entirely after adjustment for hospital-level characteristics (Table 3, model 3; Fig. 2). When we stratified the analyses by presentation with STEMI vs with NSTE-ACS, we observed that patients of colour with STEMI were equally likely to undergo coronary catheterization as White patients. In contrast, patients of colour with NSTE-ACS were less likely to undergo coronary catheterization than were White patients, but this difference diminished with additional adjustment for patient- and hospital-level characteristics (Table 3).

As shown in Figure 3, the overall reasons for a lack of cardiac catheterization were similar between the 2 groups of patients with ACS and the STEMI and NSTE-ACS subgroups (Fig. 3; Supplemental Table S1).

We presented the secondary endpoints in Table 4. Patients of colour were less likely to undergo in-hospital revascularization and seemed to have higher rates of adverse events before adjustment, with the caveat of having wide confidence intervals. Most of these differences diminished after adjustment for patient- and hospital-level factors. There were no notable differences in discharge EBMT (Supplemental Table S2).

Discussion

Our findings provide unique insights into the management of patients with ACS with diverse racial backgrounds within a universal healthcare system. Overall, our results suggest that racial disparity in ACS management may persist even in a universal healthcare context. Although patients of colour were less likely to undergo coronary catheterization, this racial disparity was no longer observed after adjustment for patient- and hospital-level characteristics. This finding suggests that patient comorbidities and hospital-level factors may have been partially responsible for the interracial differences in ACS management. Our study may partially remediate the current knowledge gap regarding racial equality within the Canadian context, in which all subjects can receive public, universal, comprehensive, and accessible care as stipulated by the

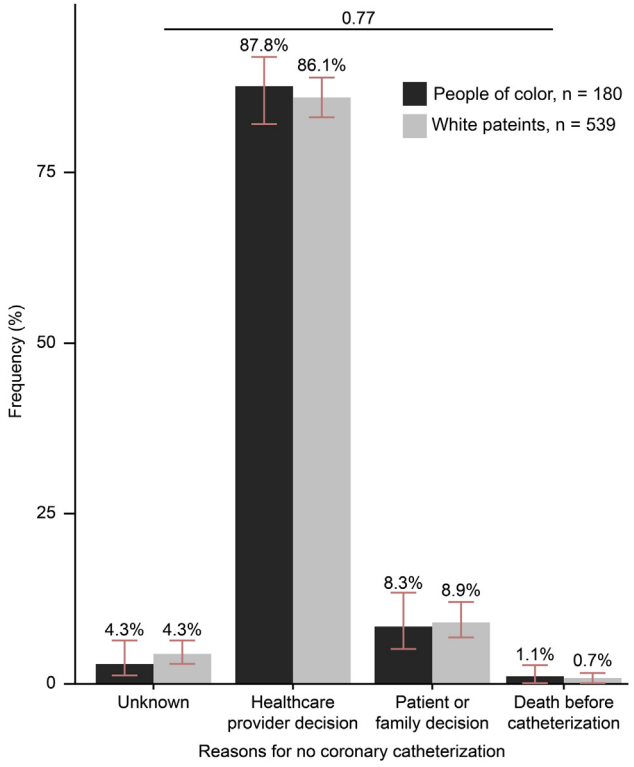

Figure 3. Analysis of the reasons for no cardiac catheterization being performed in all patients with acute coronary syndrome.

Canada Health Act.[16] As the ability to pay for procedures and medications by patients/insurance providers was no longer relevant, we were able to evaluate the impact of race on in-hospital ACS management and endpoints with a reduction of the confounding effect of socioeconomic status.

Racial/ethnic disparities are more likely to arise from interdependent socioeconomic and geopolitical factors than from pure biological or genetic differences.[22,23] Variables occurring after birth include patient-level health characteristics as well as hospital-level attributes reflecting geographic and socioeconomic factors. Adjusting for the impact of race along with factors other than sex and age may introduce posttreatment bias.[24,25] For example, evidence from US-based studies suggests that racial disparities may reflect the greater likelihood that minorities will receive care at healthcare delivery sites that underperform in quality metrics. Therefore, by adjusting for these site differences, we may be overadjusting for factors in the causal pathway.[24,26] This was the rationale for our sequential adjustments with 3 different models. Model 1 was designed to account for only nonmodifiable confounders such as age and sex; model 2 additionally adjusted for baseline clinical differences that might have explained observed differences in model 1, whereas model 3 was used to try to isolate the extent to which observed racial differences might be attributable to racial disparities regarding where patients seek care.

Previous US investigators have demonstrated marked inequalities in rates of coronary catheterization and revascularization for patients of colour, particularly Black patients, even after adjusting for patient- and hospital-level factors.[3,5,13,27,28] In contrast, the lack of racial inequality in discharge medications in our study compared favourably to other private and mixed healthcare systems in which patients of colour received less EBMT.[4,6] Moreover, we did not detect any inequality in in-hospital mortality between patients of colour and White patients.[4]

The lower unadjusted rates of cardiac catheterization for patients of colour compared to White patients in our study may be due to the following factors: (i) the lower proportion of patients of colour who presented to PCI-capable hospitals; (ii) less-frequent presentation with STEMI for patients of colour; and (iii) the higher burden of comorbidities for patients of colour (2-year higher in mean age, more diabetes mellitus, and lower mean admission hemoglobin level). Our finding of a lower rate of coronary catheterization for patients of colour was mainly driven by the difference in the subgroup with NSTE-ACS. The decision to perform coronary catheterization for patients with NSTE-ACS is generally less straightforward than that for patients with STEMI and may depend more on the patient's comorbidities and the availability of a PCI-capable facility. Furthermore, as the need to decide whether to undergo cardiac catheterization for NSTE-ACS is generally less urgent, differences in treatment preferences and cross-cultural communication challenges may play larger roles in the decision-making process.

A previous Canadian study demonstrated that South Asian and Chinese patients with ACS underwent coronary revascularization as frequently as White patients.[7] Graham et al.

Table 4. Comparison of secondary endpoints

Variables	White patients (n = 2738)	Patients of colour (n = 706)	Unadjusted	Model 1	Model 2	Model 3
Coronary revascularization						
Total in-hospital coronary revascularization (CABG + PCI)	1811 (66.1)	411 (58.2)	0.71 (0.6–0.84)	0.77 (0.65–0.92)	0.84 (0.72–1.00)	0.93 (0.71–1.21)
In-hospital PCI	1597 (58.3)	367 (52.0)	0.77 (0.66–0.91)	0.83 (0.7–0.98)	0.93 (0.78–1.10)	0.99 (0.80–1.23)
In-hospital CABG	243 (8.9)	49 (6.9)	0.77 (0.56–1.05)	0.79 (0.57–1.08)	0.70 (0.50–0.97)	0.64 (0.38–1.06)
Major adverse events						
In-hospital all-cause mortality	128 (4.7)	37 (5.2)	1.13 (0.77–1.64)	0.99 (0.68–1.47)	0.81 (0.54–1.22)	0.84 (0.52–1.34)
TIMI major bleeding	62 (2.3)	19 (2.7)	1.19 (0.71–2.01)	1.15 (0.68–1.95)	1.18 (0.66–2.11)	1.26 (0.67–2.36)
Total stroke	10 (0.4)	8 (1.1)	3.13 (1.23–7.96)	2.86 (1.10–7.42)	2.51 (1.01–6.28)	2.10 (0.74–5.97)
Discharge medications						
EBMT	2189 (79.9)	546 (77.3)	0.86 (0.7–1.04)	0.90 (0.73–1.10)	1.01 (0.82–1.25)	1.16 (0.78–1.71)

Values are n (%) or odds ratio (95% confidence interval).

CABG, coronary artery bypass graft; EBMT, evidence-based medical therapy; OR, odds ratio; PCI, percutaneous coronary intervention; TIMI, thrombolysis in myocardial infarction.

showed that only Chinese patients had a slightly increased short-term mortality risk compared to that of White patients.[7] We cannot rule out the possibility that the Asian subgroup in our cohort, who typically have outcomes and treatment patterns more similar to those of Whites than to those of Blacks and Hispanics, may have diluted our ability to discern inequalities between other racial/ethnic groups and White patients. Further studies evaluating the outcomes and treatments of specific racial/ethnic groups with ACS in the Canadian context are needed.

Study limitations

First, the lack of detailed racial information precluded examination of disparities among various specific racial groups. However, considering our sample size, a more comprehensive analysis of interracial comparisons would not have been adequately powered. Second, we did not collect information on patients' socioeconomic status; doing so might have further improved our analysis. Third, although we cannot rule out a selection bias created by excluding subjects with missing racial data, the latter represented only a small minority of patients and would not have substantially influenced our primary endpoint. Fourth, the participating hospitals' healthcare providers may be individuals who are proactive in quality improvement via their engagement in the AMI-OPTIMA KT trial (the Hawthorne effect). Therefore, the endpoints observed in our study may not necessarily apply to other Canadian facilities. Fifth, we did not evaluate the language skills of our patients. Language barriers may have contributed to differential rates of coronary catheterization between White patients and patients of colour. Sixth, since the completion of the AMI-OPTIMA trial, the diagnosis and management of ACS have evolved, with the introduction of high-sensitivity troponin assays and more-frequent invasive management in elderly and comorbid patients.[29] This secular increase in invasive management may have modified the impact of race on ACS management. Finally, despite adjustment for several known confounders and clustering, we could not exclude residual confounders, as this study was a post hoc analysis of a randomized controlled trial.

Conclusions

Racial disparity in coronary catheterization for patients with ACS persists within a universal context. Patients' comorbidities and hospital-level factors may be partially responsible for this inequality. Future research on cardiovascular care in patients with diverse racial/ethnic backgrounds in universal healthcare systems is needed to remediate racial inequality in ACS management.

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Disclosures

J.-C.T. holds the Université de Montréal Pfizer-endowed research chair in atherosclerosis and the Canada Research Chair in personalized and translational medicine. The other authors have no conflicts of interest to disclose.

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Supplementary Material

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