

Blacks in the Coronary Artery Surgery Study (CASS): Race and Clinical Decision Making

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Abstract: For patients enrolled in the Coronary Artery Surgery Study (CASS), surgery was recommended for 46.5 per cent of Blacks and 59.4 per cent of Whites, despite similar clinical and angiographic characteristics. Of those recommended, 80.5 per cent of Blacks and 90.4 per cent of Whites had bypass surgery. These differences were most apparent for Black laborers. Overall, only 38.0 per cent of Blacks had coronary artery bypass surgery, whereas 58.4 per cent of Whites received surgery. (*Am J Public Health* 1986; 76:1446-1448.)

Introduction

Clinical and angiographic factors alone do not explain variation in surgical therapy for the treatment of coronary artery disease across medical institutions.^{1,2} Demographic, economic, social, interpersonal, and organizational factors have been suggested as possible determinants of clinical decision making for a variety of medical conditions.³⁻⁵ The purpose of this paper is to examine the role of race in the Coronary Artery Surgery Study (CASS). Two questions will be addressed: how often was coronary artery bypass graft surgery recommended to Blacks and Whites; and how often was this recommendation instituted?

Methods

Patient Population

Data analyzed for this study are from the CASS registry⁶ which contains extensive demographic, clinical, and angiographic information on all consecutive patients who, giving informed consent for angiography and data collection, underwent coronary angiography for proven or suspected coronary disease. The CASS, which enrolled patients from July 1974 to May 1979, included 14 clinics in the United States and one in Canada (see Appendix). This analysis includes 13,307 of 24,959 patients, all of whom underwent angiography at CASS clinics. There were 573 Blacks and 23,008 Whites who did not have previous surgery. Patients with previous bypass surgery and/or those who were of other races were not included in the analysis. Furthermore, patients included in the analysis were candidates for bypass surgery in that they had at least one significantly diseased vessel (70 per cent or greater diameter narrowing in one or more coronary arteries or 50 per cent left main coronary artery stenosis) and also were graded as having at least Class I angina (mild symptoms) by the Canadian Cardiovascular Society classification.⁷ Patients who were part of the CASS randomized trial were

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eliminated, because their therapy was randomly assigned: 202 Blacks and 13,105 Whites were eligible for inclusion in the present study.

Study Variables

In an earlier report of the determinants of bypass surgery in CASS, variables predictive of bypass surgery were identified.² These are: 1) myocardial jeopardy, 2) number of diseased proximal vessels, 3) number of operable vessels, 4) angina severity, 5) unstable angina, and 6) the use of a beta blocking agent.

The decision-making process for coronary artery surgery involves the patient, his or her family, the cardiologist and cardiothoracic surgeon at the referral center, the referring physician, and third party payers. Early elective surgery resulting from the baseline evaluation and decision-making process is of interest. Late surgery resulting from symptomatic changes and/or reevaluation is not the focus of this analysis.

Since the reason for surgery was not recorded, and the CASS clinics had variable waiting periods for elective surgery, we arbitrarily defined cases to be early surgery if the surgery occurred within 90 days of enrollment, or (at the clinic in question) the surgery occurred within the 95th percentile of days from enrollment to surgery in the first year after enrollment. The medical group consisted of those patients who did not satisfy this definition.

Results

Clinical and Angiographic Characteristics

Key clinical and angiographic features of medical and surgical patients according to race are listed in Table 1. In both the medical and surgical groups, Whites were more likely to be male and professional, yet Blacks had more Class III and IV angina and more unstable angina. In the medical group 65.1 per cent of Blacks were laborers, yet in the surgical group only 50.7 per cent of Blacks were laborers.

Recommended and Observed Therapy

In Table 2, 95 per cent confidence intervals for Black White differences in the per cent recommended surgery and the per cent of those recommended surgery who received surgery are presented for patients with complete information for occupation, actual, and recommended therapy. Physicians recommended surgical therapy to 46.5 per cent of Blacks and 59.4 per cent of Whites. Of those Blacks and Whites who had surgery recommended, 80.5 per cent and 90.4 per cent, respectively, had surgery as defined. The ratio of White to Black for the per cent of those recommended for surgery who had surgery was 1.13. Of the 100 Blacks who had medical therapy recommended only one had surgery, whereas of the 4,652 Whites who were recommended medical therapy, 11.6 per cent had later bypass surgery. Overall, only 38.0 per cent of Blacks had surgery, while 58.4 per cent of Whites received surgery.

Surgery was recommended less often to Black laborers than to White laborers. The ratio of White to Black for the per

TABLE 1—Characteristics of Medical and Surgical Patients by Race

| Variable N | Medicine | | | Surgery | | |
|-------------------------------------|----------------|-----------------|---------|---------------|-----------------|-------|
| | Black (127) | White (5529) | P | Black (75) | White (7576) | P |
| Male Sex | 74.8 | 82.7 | .02 | 72.0 | 83.9 | .006 |
| Age (years) | 52 + 9 yrs | 54 + 9 yrs | NS | 53 + 8 yrs | 55 + 9 yrs | < .02 |
| Occupation | | | < .0001 | | | .002 |
| Laborer | 65.1 | 34.7 | | 50.7 | 34.1 | |
| Clerical | 12.7 | 24.3 | | 16.0 | 23.9 | |
| Professional | 7.1 | 24.5 | | 10.7 | 26.1 | |
| Homemaker | 10.3 | 9.7 | | 12.0 | 8.7 | |
| Other | 4.8 | 6.8 | | 10.7 | 7.2 | |
| Full-time Employment | 56.7 | 60.6 | NS | 56.0 | 63.6 | NS |
| Myocardial Jeopardy | | | NS | | | NS |
| None | 43.3 | 42.4 | | 21.3 | 18.6 | |
| Inferior | 27.6 | 21.8 | | 12.0 | 17.2 | |
| Anterior | 18.1 | 23.3 | | 42.7 | 31.9 | |
| Both | 11.0 | 12.5 | | 24.0 | 32.3 | |
| Number Operable Vessels | | | NS | | | NS |
| Zero | 7.8 | 9.1 | | 4.0 | 2.1 | |
| One | 33.1 | 33.3 | | 24.0 | 19.0 | |
| Two | 35.4 | 33.9 | | 30.7 | 35.8 | |
| Three | 23.6 | 23.7 | | 41.3 | 43.1 | |
| Angina Severity | | | .004 | | | .005 |
| Class I | .8 | 8.2 | | 0.0 | 3.5 | |
| Class II | 32.3 | 36.6 | | 10.7 | 20.4 | |
| Class III | 35.4 | 33.5 | | 41.3 | 42.9 | |
| Class IV | 17.3 | 11.0 | | 41.3 | 24.6 | |
| Unrtd to Exertion | 14.2 | 10.6 | | 6.7 | 8.7 | |
| Number of Diseased Proximal Vessels | | | NS | | | NS |
| Zero | 48.8 | 40.6 | | 22.7 | 21.4 | |
| One | 35.4 | 38.8 | | 44.0 | 36.6 | |
| Two | 11.8 | 15.0 | | 22.7 | 27.0 | |
| Three | 3.9 | 5.6 | | 10.7 | 15.0 | |
| Unstable Angina | 44.9 | 29.1 | .0001 | 60.0 | 47.2 | .027 |
| Beta Blocking Agent | 42.5 | 47.7 | NS | 60.0 | 59.3 | NS |

cent of those recommended for surgery who had surgery was 1.17. Small numbers of Blacks in the non-laborers categories precluded further comparisons. Finally, stepwise logistic regression, which allowed race to enter after controlling for the six predictors of therapy, indicated that race was a statistically significant predictor of recommended therapy for all patients ($p = .002$) and for laborers ($p = .001$).

Discussion

The major finding of this study was that in CASS there existed a large Black White differential in coronary artery bypass surgery. This differential was not due to differences in clinical and angiographic characteristics of Blacks and Whites. Much of the differential in surgery rates was due

TABLE 2—Race, Occupation, and Therapy

| | Per Cent Recommended Surgery | | | Per Cent with Surgery Recommended Receiving Surgery | | |
|--------------|------------------------------|---------|--------------|-----------------------------------------------------|--------|--------------|
| | Black | White | 95% CI B-W | Black | White | 95% CI B-W |
| Laborer | 42.3 | 59.1 | (7.5,26.1) | 76.6 | 89.3 | (.5,24.1) |
| (N) | (111) | (3893) | | (47) | (2302) | |
| Clerical | 48.1 | 59.0 | (-8.0,29.8) | 84.6 | 90.6 | (-13.7,25.7) |
| (N) | (27) | (2725) | | (13) | (1607) | |
| Professional | 57.1 | 59.8 | (-23.3,28.7) | 87.5 | 91.4 | (-19.1,26.9) |
| (N) | (14) | (2929) | | (8) | (1751) | |
| Homemaker | 50.0 | 57.9 | (-13.2,29.0) | 81.8 | 89.8 | (-14.9,30.9) |
| (N) | (22) | (1053) | | (11) | (610) | |
| Other | 61.5 | 62.6 | (-25.5,27.7) | 87.5 | 91.1 | (-19.4,26.6) |
| (N) | (13) | (861) | | (8) | (539) | |
| Total | 46.5 | 59.4 | (5.9,20.3) | 80.5 | 90.4 | (1.6,18.2) |
| (N) | (187) | (11461) | | (87) | (6809) | |

CI = 95% Confidence Interval.

The per cent of individuals with medicine recommended receiving surgery was 1.0% for Blacks and 11.6% for Whites.

to Whites who were recommended medical therapy but had surgery, nevertheless.

Other investigators have also reported that a lower percentage of Black patients had bypass surgery than did Whites.^{8,9*}

The 202 Black surgical candidates were a subset of the 573 Blacks enrolled in CASS. It is deserving of emphasis that such a small number of Blacks underwent coronary angiography given that coronary heart disease is the leading cause of death among Blacks.¹⁰

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APPENDIX

Cooperating Clinical Sites

University of Alabama in Birmingham: William J. Rogers, MD*, Richard O. Russell, Jr., MD, Albert Oberman, MD, and Nicholas T. Kouchoukos, MD. *Albany Medical College:* Eric D. Foster, MD*, Julio A. Sosa, MD*, Joseph T. Doyle, MD, Martin F. McKneally, MD, Joseph B. McIllduff, MD, Harry Odabashian, MD, and Thomas M. Older, MD. *Boston University:* Thomas Ryan, MD*, David Faxon, MD, Laura Wexler, MD, Robert L. Berger, MD, Donald Weiner, MD, and Carolyn H. McCabe, BS. *Loma Linda University:* Melvin P. Judkins, MD*, and Joan Coggin, MD.* *Marshfield Medical Foundation, Inc. and Marshfield Clinic:* William Myers, MD*, Richard D. Sautter, MD*, John N. Browell, MD, Dieter M. Voss, MD, and Robert D. Carlson, MD. *Massachusetts General Hospital:* J. Warren Harthorne, MD*, W. Gerald Austen, MD*, Robert Dinsmore, MD, Frederick Levine, MD, and John McDermott, MD. *Mayo Clinic and Mayo Foundation:* Robert L. Frye, MD*, Bernard Gersh, MD, David R. Holmes, MD, Michael B. Mock, MD, Hartzell Schaff, MD, and Ronald E. Vlietstra, MD. *Miami Heart Institute:* Arthur J. Gosselin, MD*, Parry B. Larsen, MD, and Paul Swaye, MD. *Montreal Heart Institute:* Martial G. Bourassa, MD*, Claude Goulet, MD, and Jacques Lesperance, MD. *New York University:* Ephraim Glassman, MD*, and Michael Schloss, MD. *St. Louis University:* George Kaiser, MD*, J. Gerard Mudd, MD*, Robert D. Wiens, MD, Hendrick B. Barner, MD, John E. Codd, MD, Dennis H. Tyras, MD, Vallee L. Willman, MD, and Bernard R. Chaitman, MD. *St. Luke's Hospital Center:* Harvey G. Kemp, Jr, MD*, and Airlie Cameron, MD. *Stanford University:* Edwin Alderman, MD*, Francis H. Koch, MD, Paul R. Cipriano, MD, James F. Silverman, MD, and Edward B. Stinson, MD. *Medical College of Wisconsin:* Felix Tristani, MD*, Harold L. Brooks, MD*, and Robert J. Flemma, MD. *Yale University:* Lawrence S.

Cohen, MD*, Rene Langou, MD, Alexander S. Geha, MD, Graeme L. Hammond, MD, and Richard K. Shaw, MD. *Central Electrocardiographic Laboratory, University of Alabama:* L. Thomas Sheffield, MD*, David Roitman, MD, and Carol Troxell, BS. *Coordinating Center, University of Washington:* Kathryn Davis, PhD*, Mary Jo Gillespie, MS, Lloyd Fisher, PhD, J. Ward Kennedy, MD, Richard Kronmal, PhD, and Kevin Cain, PhD. *Chairman of the Steering Committee:* Thomas Killip, MD. *Beth Israel Medical Center National Heart, Lung and Blood Institute:* Eugene R. Passamani, MD, Thomas Robertson, MD, Charles Hollingsworth, Dr PH, and Peter Frommer, MD.

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REFERENCES

1. Alderman EL, Fisher LD, Maynard C, Mock MB, Ringqvist I, Bourassa MG, Kaiser GC, Gillespie MJ: Determinants of coronary surgery in a consecutive patient series from geographically dispersed medical centers. *Circulation* 1982; 66 (Suppl I):I-6-I-15.
2. Maynard C, Fisher LD, Alderman EL, Mock MB, Ringqvist I, Bourassa MG, Kaiser CG, Gillespie MJ: Institutional Differences in Therapeutic Decision Making in the Coronary Artery Surgery Study (CASS): The Role of Organizational Factors. *Medical Decision Making*, 1986, 6:127-135.
3. Eisenberg JM: Sociologic influences on decision making by clinicians. *Ann Intern Med* 1979; 90:957-964.
4. Katz P: How Surgeons Making Decisions. In: Hahn RA, Gaines AD (eds): *Physicians of Western Medicine*. Dordrecht: D Reidel Publishing Co, 1985; 155-175.
5. Elstein AS, Rovner DL, Holzman GB, Ravitch M, Rothert MC, Holmes MA: Psychological approaches to medical decision making. *Am Behav Sci* 1982; 25:557-584.
6. Principal Investigators of CASS and their Associates (Killip T (ed), Fisher LD, Mock MB (assoc eds): *National Heart, Lung, and Blood Institute Coronary Artery Surgery Study (CASS)*. *Circulation* 1981; 63 (Suppl I): I-1.
7. Campeau L: Grading of angina pectoris. *Circulation* 1976; 54:522-523.
8. Graves E, Haupt GJ: *Detailed Diagnoses and Surgical Procedures for Patients Discharged from Short-stay Hospitals, United States, 1979*. DHHS Pub. No. (PHS) 83-1733. Washington DC: National Center for Health Statistics, US Public Health Service, 1983.
9. Oberman A, Cutter G: Issues in the natural history and treatment of coronary heart disease in Black populations: Surgical treatment. *Am Heart J* 1984; 108:688-694.
10. Maynard C, Fisher LD, Passamani ER, Pullum T: Blacks in the Coronary Artery Surgery Study (CASS): Risk factors and coronary artery disease. *Circulation*, 1986, 74:64-71.

*Young LY: Who is likely to have Coronary Bypass Surgery. Paper presented to the Annual Meeting of the American Statistical Association, August 1983.