
Differences by Race in the Rates of Procedures Performed in Hospitals for Medicare Beneficiaries

A. Marshall McBean, M.D., M.Sc., and Marian Gornick, M.A.

This study analyzes administrative data from the Medicare program to compare differences by race in the use of 17 major procedures performed in the hospital. In both 1986 and 1992, black beneficiaries were less likely than white beneficiaries to have received these procedures while hospitalized. The largest differences were seen for "referral-sensitive surgeries" such as percutaneous transluminal coronary angioplasty, coronary artery bypass graft surgery, total knee replacement, and total hip replacement. These differences by race suggest that there are barriers to these services.

In contrast, black beneficiaries were found to have substantially higher rates than white beneficiaries in the use of four procedures performed in the hospital: amputation of part of the lower limb, surgical debridement, arteriovenostomy, and bilateral orchiectomy. The types of procedures for which black beneficiaries have higher rates raise questions about whether there is a need for more comprehensive and continuous ambulatory care for the underlying health conditions associated with these procedures.

INTRODUCTION

The 1965 Medicare legislation was intended to reduce financial barriers to hospital and physicians' services for the elderly population in the United States. The

implementation of the Medicare program meant that virtually the entire population 65 years of age or over became covered for Medicare Part A hospital services and entitled to enroll voluntarily in the Medicare Part B physicians' and related services program. As a condition of participation in the Medicare program, hospitals were required to be in compliance with title VI of the Civil Rights Act of 1964. Title VI requires that no one be excluded, on the ground of race, color, or national origin, from benefits under any program receiving Federal financial assistance. As observed by Myers (1970), the Medicare legislation, almost overnight, brought an end to segregation in hospitals. Thus, the Medicare program could be expected to improve access to physicians' and hospital services for all of the elderly in the Nation. However, some predicted that the discrepancies in access to health care services would very likely not fully disappear (Bergner and Yerby, 1968).

Early reports prepared from Medicare administrative data showed that the hospital discharge rate for beneficiaries of races other than white in 1967, the first full year of Medicare, was only 71 percent of the rate for white beneficiaries—189 discharges per 1,000 enrollees for races other than white, compared with 266 discharges per 1,000 white enrollees (Social Security Administration, 1975). In succeeding years, the hospital discharge rate increased, rising faster for beneficiaries of races other than white than for white beneficiaries. By 1986, the higher discharge rates for white persons had disappeared,

A. Marshall McBean was with the Health Care Financing Administration (HCFA) when this article was written and is now with the University of Minnesota. Marian Gornick is with HCFA. The statements and opinions expressed are those of the authors and do not necessarily reflect those of HCFA or the University of Minnesota.

and, by 1992, the rates were 10 percent higher for black beneficiaries.

However, more detailed examination of Medicare administrative data for hospitalizations in 1986 showed differences by race in the rates of many procedures. Rates for 14 major procedures were consistently lower for black beneficiaries compared with white beneficiaries (Health Care Financing Administration, 1990). Data for subsequent years indicated that the differences by race in the procedures studied persisted through the end of the decade (Health Care Financing Administration, 1992, 1993, 1994).

Other studies have focused particularly on differences by race in the use of heart procedures. Wenneker and Epstein (1989) analyzed 1985 hospital discharge data from Massachusetts and reported lower rates of coronary angiography and coronary artery bypass graft (CABG) surgery for black persons admitted for circulatory disease or chest pain compared with white persons admitted for the same diagnoses. They found no differences in the rates of percutaneous transluminal coronary angioplasty (PTCA). Udvarhelyi et al. (1992) examined Medicare administrative data for these same procedures performed for Medicare patients hospitalized in 1987 with acute myocardial infarction (AMI). They found that black beneficiaries had substantially lower rates of cardiac catheterization, CABG surgery, and PTCA in the 90 days following the AMI, although 2-year survival was the same in both races. Similarly, Whittle et al. (1993) showed that white veterans treated in Veterans Affairs hospitals from 1987 through 1991 were more likely to undergo cardiac catheterization, PTCA, and CABG surgery. In our analysis of trends for Medicare beneficiaries in the last half of the 1980s, we found substantial differences by race in CABG surgery and

PTCA (McBean, Warren, and Babish, 1994). Thus, information from several different data sources from the last half of the 1980s has highlighted greater use of surgical procedures, particularly cardiac procedures, in white persons compared with black persons.

Recently, Escarce et al. (1993) used Medicare Part B data for 1986 to examine differences by race in a number of non-surgical and surgical procedures. For many important diagnostic procedures, such as electrocardiograms, non-invasive cardiac imaging, sigmoidoscopy, colonoscopy, chest X-ray, magnetic resonance imaging of the brain, and computerized tomographic scan of the head, rates were all significantly greater in white Medicare beneficiaries compared with black beneficiaries.

This article continues the exploration of differences by race in the rates at which 17 major procedures are performed in the hospital. Several of these procedures (for example, CABG, PTCA, knee replacement, and hip replacement) are considered to be "referral-sensitive procedures" (Institute of Medicine, 1993). In addition, to understand better the overall patterns of use of surgical procedures in the two racial groups, this study raises the question: Are there procedures that tend to be performed more frequently for black beneficiaries compared with white beneficiaries? Accordingly, we sought to identify the types of hospitalizations in which the procedure rates were higher among black beneficiaries.

METHODS

Medicare administrative data were used as the basic source for this study. Data were derived from the Medicare Provider Analysis and Review (MEDPAR) files for calendar years 1986 and 1992. Nearly all

hospitalizations of the elderly in short-stay hospitals are covered under Medicare, and reimbursement claims submitted by the hospitals are used to create a record of each hospitalization in the MEDPAR file. Each record contains the dates of admission and discharge, up to five diagnoses (the first listed is the principal diagnosis), up to three procedures, and the diagnosis-related group (DRG) on which hospital reimbursement was based. Procedures are coded using the *International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM)*.

Procedures Examined

First, the MEDPAR files were used to identify 17 major procedures performed on Medicare beneficiaries 65 years of age or over. Second, the MEDPAR files were used to identify individual or closely related surgical DRGs for which hospitalization occurred at least 25 percent more frequently among black beneficiaries and for which at least 1,000 admissions for this DRG occurred among black beneficiaries. Subsequently, the ICD-9-CM codes for the procedures performed in these DRG groupings were identified. Four procedure codes (or groups of codes) met the criteria of occurring at least 1,000 times and performed at least 25 percent more frequently among black beneficiaries compared with white beneficiaries. The Technical Note shows the ICD-9-CM procedure codes used to select the MEDPAR records. Date of death, obtained from Medicare enrollment files, is appended to the record to track death up to 2 years after the year of discharge from the hospital.

Calculation of Rates

Information from the Medicare denominator file was used to create rates of utilization.

A denominator file exists for each calendar year, from 1985 onward; each file includes a record for 100 percent of the Medicare enrollees and allows the development of utilization rates for various demographic and geographic levels of aggregation.

For Medicare beneficiaries enrolled in health maintenance organizations (HMOs), hospital-stay records are incomplete. Therefore, records for HMO enrollees (about 6 percent of all beneficiaries in 1990) were eliminated from the numerator and denominator in the computation of procedure rates.

A procedure was counted if it appeared in any of the three fields reserved for procedures on the MEDPAR record. Hospitalization rates per 1,000 Medicare beneficiaries were age- and sex-adjusted by the direct method, using the 1986 age-sex composition (based on 10-year intervals) of the Medicare population as the standard.

For each procedure, the 30-day post-admission death rate was calculated and age- and sex-adjusted by the direct method, using the 1986 age-sex distribution of discharges for that procedure as the standard. The 30-day post-admission mortality rate, rather than the inpatient hospital mortality rate, was used in order to compensate for differences across hospitals and changes over time in length of stay. On a population basis, the 30-day post-admission mortality rate very likely reflects both the severity of illness of the patient population and quality of care.

Statistical Analysis

Comparisons of the rates for black beneficiaries with the rates for white beneficiaries were made using the odds ratio (black:white). The 95-percent confidence intervals for the odds ratios were calculated according to Woolf's method (Kahn and

Table 1

Number and Rate of Total Hospital Discharges and Discharges for Surgical Diagnosis-Related Groups (DRGs) for Medicare Beneficiaries 65 Years of Age or Over, by Race: 1986-92

Year	White Beneficiaries		Black Beneficiaries		Black/White Ratio
	Number of Discharges (in Thousands)	Rate per 1,000 Enrollees	Number of Discharges (in Thousands)	Rate per 1,000 Enrollees	
Total Hospital Discharges					
1986	7,683	325.47	667	334.24	1.03
1987	7,682	321.75	680	336.01	1.04
1988	7,789	321.34	699	340.41	1.06
1989	7,662	310.86	704	337.55	1.09
1990	7,891	315.74	726	342.92	1.09
1991	8,301	328.87	776	359.95	1.09
1992	8,292	326.07	786	360.22	1.10
Surgical DRG Discharges					
1986	2,100	88.84	149	74.57	0.84
1987	2,179	91.27	157	77.66	0.85
1988	2,209	91.14	161	78.38	0.86
1989	2,163	87.76	158	75.83	0.86
1990	2,218	88.74	160	75.34	0.85
1991	2,269	89.89	159	73.78	0.82
1992	2,265	89.07	161	73.66	0.83

NOTE: Only Medicare enrollees 65 years of age or over who were not members of health maintenance organizations (HMOs) are included.

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy; Data from the Medicare Provider Analysis and Review file, 1986-92.

Sempos, 1989). For each procedure, the confidence intervals for 1986 and 1992 were compared. Because the number of procedures performed was large, in all cases the confidence intervals were extremely narrow and did not overlap. This was true even for other arthroplasty of the hip where the odds ratios for 1986 and 1992 presented in Table 3 were both 0.45. Therefore, none of the confidence intervals is presented in the tables.

RESULTS

Table 1 shows Medicare hospital discharge rates for persons 65 years of age or over for 1986 through 1992. As noted earlier, when Medicare was first implemented, hospitalization rates for beneficiaries among races other than white were substantially lower than those for white beneficiaries. By 1986, the total hospital discharge rate was 334.24 discharges per 1,000 for black beneficiaries and 325.47 discharges per 1,000 for white beneficiaries, a

black:white ratio of 1.03. By 1992, the rate was 360.22 per 1,000 for black beneficiaries and 326.07 per 1,000 for white beneficiaries, a black:white ratio of 1.10. These figures reflect the gradual trend of increasingly greater hospitalization rates for black beneficiaries compared with white beneficiaries.

However, as shown in Table 1, throughout the period 1986-92, black beneficiaries were consistently less likely than white beneficiaries to be hospitalized for a surgical DRG, the black:white ratio ranging from 0.82 to 0.86.

Table 2 shows the number and rate of four major cardiovascular procedures in 1986 and 1992. In 1992, for beneficiaries 65 years of age or over, cardiac catheterization was performed over 400,000 times, PTCA and CABG surgery occurred approximately 125,000 times each, and carotid endarterectomy, about 60,000 times. The three therapeutic cardiac or vascular procedures (PTCA, CABG surgery, and carotid endarterectomy) and the diagnostic procedure (cardiac catheterization)

Table 2

Number and Rates of Heart and Vascular Procedures and 30-Day Post-Admission Mortality Rates for Medicare Beneficiaries 65 Years of Age or Over, by Race: 1986 and 1992

Procedure and Race	Procedure Rate						30-Day Post-Admission Mortality Rate			
	1986			1992			1986		1992	
	Number	Rate per 1,000 Enrollees	Black/White Ratio	Number	Rate per 1,000 Enrollees	Black/White Ratio	Rate per 1,000 Discharges	Black/White Ratio	Rate per 1,000 Discharges	Black/White Ratio
Cardiac Catheterization										
White	226,381	9.52		409,074	16.19		(1)	(1)	(1)	(1)
Black	9,924	4.97	0.52	23,539	11.05	0.68	(1)	(1)	(1)	(1)
Percutaneous Transluminal Coronary Angioplasty										
White	31,433	1.32		125,610	4.98		37.38		23.27	
Black	839	0.42	0.32	4,703	2.21	0.44	39.33	1.05	24.38	1.05
Coronary Artery Bypass Graft										
White	68,753	2.89		121,020	4.79		59.90		40.57	
Black	1,620	0.81	0.28	3,920	1.85	0.39	79.01	1.32	45.61	1.12
Carotid Endarterectomy										
White	46,465	1.95		60,090	2.36		20.53		15.53	
Black	1,092	0.55	0.28	1,569	0.73	0.31	21.98	1.07	20.43	1.32

¹Not applicable because cardiac catheterization is a diagnostic procedure that is often followed by a surgical procedure.

NOTE: Data are age- and sex-adjusted.

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the Medicare Provider Analysis and Review file, 1986 and 1992.

were performed at a substantially lower rate for black beneficiaries compared with white beneficiaries in both 1986 and 1992. Over the 7 years, the rates increased for all four procedures and for both races. Cardiac catheterization increased 70 percent for white beneficiaries and 122 percent for black beneficiaries. During this period, the rate for the newest procedure, PTCA, increased 277 percent for white beneficiaries and 426 percent for black beneficiaries; the rates for CABG surgery and carotid endarterectomy increased by 66 and 21 percent, respectively, for white beneficiaries, while the corresponding increases were 128 and 33 percent for black beneficiaries. Thus, in 1992, the black:white ratio of the rates for the four procedures—0.68 for cardiac catheterization, 0.44 for PTCA, 0.39 for CABG surgery, and 0.31 for carotid endarterectomy—were all higher than in 1986.

In both 1986 and 1992, the 30-day post-admission mortality rates following the three

therapeutic procedures were consistently higher for black beneficiaries compared with white beneficiaries. In 1986, mortality was highest for CABG surgery—79.01 deaths per 1,000 procedures for black beneficiaries and 59.90 deaths per 1,000 procedures for white beneficiaries, a 32-percent differential. For the two cardiac surgeries, the 30-day mortality rates decreased dramatically for both races between 1986 and 1992; for white beneficiaries, the mortality rate fell 38 percent following PTCA, and 32 percent following CABG surgery, and, for black beneficiaries, the corresponding decreases were 38 and 42 percent. In 1992, the black:white ratio of the 30-day post-admission mortality rate was 1.05 for PTCA, 1.12 for CABG surgery, and 1.32 for carotid endarterectomy.

Table 3 shows similar information for four orthopedic and three back procedures. Total knee and total hip replacement and the three back procedures are generally considered to be referral-sensitive surgeries. Reduction of fracture of the femur

Table 3

Number and Rates of Orthopedic and Back Procedures and 30-Day Post-Admission Mortality Rates for Medicare Beneficiaries 65 Years of Age or Over, by Race: 1986 and 1992

Procedure and Race	Procedure Rate						30-Day Post-Admission Mortality Rate			
	1986			1992			1986		1992	
	Number	Rate per 1,000 Enrollees	Black/White Ratio	Number	Rate per 1,000 Enrollees	Black/White Ratio	Rate per 1,000 Discharges	Black/White Ratio	Rate per 1,000 Discharges	Black/White Ratio
Reduction of Fracture of Femur										
White	110,595	4.65		132,447	4.99		58.64		57.51	
Black	3,967	1.99	0.43	4,950	2.21	0.44	51.42	0.88	47.71	0.83
Other Arthroplasty of Hip										
White	55,879	2.35		71,178	2.69		54.35		55.27	
Black	2,097	1.05	0.45	2,715	1.21	0.45	63.42	1.17	46.68	0.84
Total Knee Replacement										
White	50,077	2.11		105,670	4.17		5.35		4.28	
Black	2,424	1.21	0.57	5,805	2.68	0.64	6.19	1.16	6.31	1.47
Total Hip Replacement										
White	58,808	2.47		67,876	2.66		17.48		13.56	
Black	2,178	1.09	0.44	2,806	1.30	0.49	16.07	0.92	14.98	1.10
Laminectomy										
White	22,488	0.95		56,069	1.54		16.36		10.07	
Black	1,038	0.52	0.55	1,737	0.81	0.53	22.16	1.35	20.38	2.02
Excision of Disc										
White	20,606	0.87		33,816	1.35		7.18		5.37	
Black	794	0.40	0.46	1,451	0.68	0.50	7.56	1.05	11.41	2.12
Spinal Fusion										
White	5,488	0.23		16,092	0.64		19.50		13.80	
Black	273	0.14	0.61	846	0.40	0.63	25.64	1.31	21.57	1.56

NOTE: Data are age- and sex-adjusted.

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the Medicare Provider Analysis and Review file, 1986 and 1992.

occurred more than 130,000 times in 1992. Total knee replacement more than doubled between 1986 and 1992; it was performed more than 110,000 times in 1992. Other arthroplasty of the hip (partial hip replacement) and total hip replacement occurred approximately 70,000 times each. Together, the three back procedures occurred approximately 110,000 times. As with the cardiovascular procedures, in both 1986 and 1992, these seven orthopedic and back procedures were performed at substantially lower rates for black beneficiaries compared with white beneficiaries. Between 1986 and 1992, large increases in rates were seen for both races for the three back procedures; laminectomy, excision of disc, and spinal

fusion increased 62, 55, and 178 percent, respectively, for white beneficiaries and 56, 70, and 186 percent for black beneficiaries. Total knee replacement also rose dramatically between 1986 and 1992, increasing 98 percent among white beneficiaries and 121 percent among black beneficiaries. In 1992, the black rates for these orthopedic and back procedures were between 44 percent (reduction of fracture of the hip) and 64 percent (total knee replacement) as great as for white beneficiaries.

In 1992, the 30-day post-admission mortality rates following the orthopedic and back procedures ranged from 57.51 deaths per 1,000 procedures (reduction of fracture of the femur for white beneficiaries) to 4.28

Table 4

Number and Rates of Selected Surgical Procedures and 30-Day Post-Admission Mortality Rates for Medicare Beneficiaries 65 Years of Age or Over, by Race: 1986 and 1992

Procedure and Race	Procedure Rate						30-Day Post-Admission Mortality Rate			
	1986			1992			1986		1992	
	Number	Rate per 1,000 Enrollees	Black/White Ratio	Number	Rate per 1,000 Enrollees	Black/White Ratio	Rate per 1,000 Discharges	Black/White Ratio	Rate per 1,000 Discharges	Black/White Ratio
Prostatectomy										
White	218,829	22.99		211,851	20.55		12.57		9.22	
Black	17,420	21.87	0.95	16,738	19.99	0.97	14.18	1.13	11.72	1.27
Open Cholecystectomy¹										
White	120,181	5.05		131,430	5.25		34.03		29.86	
Black	6,091	3.05	0.60	6,919	3.28	0.62	45.15	1.33	39.76	1.33
Repair of Inguinal Hernia										
White	88,511	3.72		41,937	1.62		11.22		16.68	
Black	4,917	2.46	0.66	2,936	1.38	0.85	19.93	1.78	18.81	1.13
Mastectomy										
White	49,367	3.46		51,953	3.43		5.81		4.96	
Black	2,973	2.48	0.72	3,641	2.76	0.80	5.72	0.98	7.42	1.50
Hysterectomy										
White	43,803	3.07		54,906	3.87		8.56		7.44	
Black	2,410	2.01	0.65	2,897	2.21	0.60	14.52	1.70	15.16	2.04
Appendectomy										
White	11,883	0.50		11,522	0.45		31.89		27.64	
Black	849	0.33	0.70	729	0.34	0.76	52.93	1.66	64.44	2.33

¹Data for open cholecystectomy are for 1990 instead of 1992 because of the large number of laparoscopic cholecystectomies performed in 1991 and 1992.

NOTE: Data are age- and sex-adjusted.

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the Medicare Provider Analysis and Review file, 1986, 1990, and 1992.

deaths per 1,000 (total knee replacement for white beneficiaries). Except for reduction of fracture of the femur and other arthroplasty of the hip, the 30-day post-admission mortality rates in 1992 for the other five procedures were greater for black beneficiaries compared with white beneficiaries; the black:white ratio of the 30-day post-admission mortality rates ranged from 2.12 for excision of disc to 1.10 for total hip replacement.

Table 4 shows similar information for 1986 and 1992 for six other procedures frequently performed in the hospital for Medicare beneficiaries. In 1992, prostatectomies occurred over 225,000 times among males and, in 1990, open cholecystectomy occurred over 135,000 times in the hospital. Of the 17 procedures examined thus far, Table 4 contains the only procedures

for which the rates did not increase between 1986 and 1992. Among these six surgical procedures performed in the hospital, rates decreased for both races for inguinal hernia repair, open cholecystectomy, and appendectomy (for white beneficiaries). The decline in the rates for inguinal hernia repair reflects the fact that this procedure is now being done on an outpatient basis; open cholecystectomy declined substantially between 1990 and 1992 due to the introduction of laparoscopic cholecystectomy, a procedure performed on an outpatient or inpatient basis. In 1992, the ratio of the procedure rate for black beneficiaries to that for white beneficiaries ranged from 0.97 for prostatectomy to 0.60 for hysterectomy. These ratios tended to be higher than those for the procedures discussed previously.

Table 5

Number and Rates of Selected Procedures for Which the Rates are Higher for Black Beneficiaries Than for White Beneficiaries and 30-Day Post-Admission Mortality Rates for Medicare Beneficiaries 65 Years of Age or Over: 1986 and 1992

Procedure and Race	Procedure Rate						30-Day Post-Admission Mortality Rate			
	1986			1992			1986		1992	
	Number	Rate per 1,000 Enrollees	Black/White Ratio	Number	Rate per 1,000 Enrollees	Black/White Ratio	Rate per 1,000 Discharges	Black/White Ratio	Rate per 1,000 Discharges	Black/White Ratio
Amputation of Part of Lower Limb										
White	40,271	1.71		45,114	1.75		100.64		98.18	
Black	10,986	5.54	3.24	13,879	6.33	3.62	84.60	0.84	77.31	0.79
Excisional Debridement										
White	58,727	2.50		64,842	2.53		85.24		78.20	
Black	11,683	5.91	2.36	14,713	6.70	2.65	115.58	1.36	95.55	1.22
Arteriovenostomy										
White	14,369	0.61		20,744	0.82		141.39		68.03	
Black	4,874	2.45	4.02	9,148	4.24	5.17	82.14	0.58	44.97	0.66
Bilateral Orchiectomy										
White	15,872	1.80		11,735	1.12		21.38		21.09	
Black	2,245	2.82	1.57	2,107	2.47	2.21	34.07	1.59	20.90	0.99

NOTE: Data are age- and sex-adjusted.

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the Medicare Provider Analysis and Review file, 1986 and 1992.

Except for mastectomy performed in 1986, the 30-day post-admission mortality rates following the seven procedures were greater for black beneficiaries compared with white beneficiaries in both 1986 and 1992. In 1992, the black:white ratio ranged from 1.13 for inguinal hernia repair to 2.33 for appendectomy.

Table 5 shows the four procedures for which black beneficiaries were more likely to be hospitalized than white beneficiaries. They are amputation of part of the lower limb (usually as a consequence of diabetes); excisional debridement (removal of tissue, usually related to decubitus ulcers); arteriovenostomy (shunts or cannulae implanted for chronic renal dialysis); and bilateral orchiectomy (removal of both testes, generally performed for cancer) in males. These procedures are considered non-elective. In 1992, excisional debridement was one of the three listed procedures in almost 65,000 hospitalizations of white beneficiaries and about 15,000 hospitalizations of black beneficiaries. Amputations of

part of the lower limb were performed somewhat less frequently, approximately 45,000 times for white beneficiaries and slightly under 14,000 times for black beneficiaries in 1992. Neither of these two procedures increased dramatically in either race between 1986 and 1992. Arteriovenostomies occurred slightly less than 30,000 times in 1992; between 1986 and 1992, the rate increased by 34 percent in white beneficiaries and by 73 percent in black beneficiaries. Bilateral orchiectomy rates decreased for both races between 1986 and 1992. The decrease was much greater for white males (38 percent) compared with black males (12 percent). In 1992, arteriovenostomy had the greatest black:white ratio (5.17), followed by amputation of part of the lower limb (3.62), excisional debridement (2.65), and bilateral orchiectomy (2.21). The black:white ratio for each of the four procedures was greater in 1992 compared with 1986.

Table 5 also shows the 30-day post-admission mortality rates for these four

procedures. The mortality rates following amputation of part of the lower limb, excisional debridement, and arteriovenostomy were generally higher in both 1986 and 1992 than the mortality rates following any of the 17 procedures shown in the preceding tables; the 30-day mortality rates in 1992 ranged from 44.97 per 1,000 discharges following arteriovenostomy in black beneficiaries to 98.18 per 1,000 discharges in white beneficiaries following amputation of part of the lower limb. The greatest decreases in the 30-day post-admission mortality rates were seen in persons who had arteriovenostomies; the 30-day post-admission mortality rates declined approximately 50 percent for both black and white beneficiaries. Over time, the ratios of the black:white mortality rates were relatively stable following amputation of part of the lower limb (0.79 in 1992), excisional debridement (1.22 in 1992), and arteriovenostomy (0.66 in 1992). This was not true for bilateral orchiectomy; the ratio decreased markedly between 1986 and 1992, reflecting the large drop in the mortality rate among black males.

DISCUSSION

In 1986 and 1992, the black:white ratios of the procedure rates for the 17 major procedures discussed in this study were all less than 1.0; for six of the procedures, the ratios were less than 0.50. Although the rates for most of these procedures increased more in black beneficiaries than in white beneficiaries, the rates in 1992 remained lower for black beneficiaries compared with white beneficiaries. Over the 7-year period, procedure rates for three of the major procedures (cardiac operations and total knee replacement) increased substantially for both races. For those traditional procedures such as prostatectomy, hysterectomy, and mastectomy,

procedure rates were relatively stable, and differences by race tended to be lower than those derived for the other major procedures studied.

The 30-day post-admission mortality rate following these procedures, when applied at the hospital level, has generally been used to monitor the quality of care provided in the institution or region. However, the 30-day post-admission mortality rate, applied on a population basis rather than on a hospital basis, very likely measures, in part, differences in the overall severity of illness in the patient population undergoing the surgical procedure. The consistently higher 30-day post-admission mortality rates for black beneficiaries (for 15 of the 17 major procedures studied), coupled with their lower utilization rates, suggest that there may be higher levels of severity of illness among black beneficiaries at the time the procedures are performed. It may be that those factors that influence lower utilization of surgical procedures among black beneficiaries compared with white beneficiaries result in black beneficiaries having the surgical procedures, on average, later in the course of the illnesses, which would increase their risk of death in the postoperative period. That is, there may be fewer healthier black beneficiaries undergoing these treatments compared with white beneficiaries. Thus, it is likely that the higher 30-day post-admission mortality rates for these procedures describe part of the impact of lower utilization of surgical procedures among black beneficiaries.

There may be several factors influencing the differences found in procedure rates by race. One reason for delaying or avoiding treatment may be financial disincentives among black Medicare beneficiaries. While it is true that all persons in our study have Part A Medicare coverage and 97 percent purchase Part B coverage or

have it purchased on their behalf, a greater percentage of black beneficiaries than white beneficiaries are liable for Medicare deductibles and copayments out of pocket (Escarce et al., 1993; Rice and McCall, 1985). The 1989 National Health Interview Survey estimated that 79 percent of white elderly persons had private insurance or Medicaid to supplement their Part A and Part B coverage (74 percent private and 5 percent Medicaid), whereas only 54 percent of black elderly persons had such coverage (36 percent private and 18 percent Medicaid) (Adams and Benson, 1990). However, the differences in treatment practices appear so large as to very likely result from other factors, in addition to differences in supplemental health insurance coverage.

Another factor influencing these differences may involve the health care delivery system. It may be that black persons are less likely to receive care from private physicians and are more likely to receive care from a variety of sources, which could result in delays in the management of the patient and increases in the time before surgical intervention is attempted. The 133 percent higher 30-day post-admission mortality rate for black beneficiaries following admission for appendectomy indicates that there may also be delays in self-referral to the health care system.

While differences in economic status and health care delivery may explain some of the differences by race, patient preferences, as well as provider opinion and selection, may also contribute. In the Coronary Artery Surgery Study (Maynard, Passamani, and Pullum, 1986), white persons were found to have a greater preference for coronary artery surgery than black persons. These are issues which should be explored further and which need to be the focus of attention by providers and beneficiary advocacy groups.

As we reported earlier (McBean, Warren, and Babish, 1994), during the period 1986 through 1990, the 30-day post-admission mortality rates following PTCA and CABG surgery declined significantly for both races. In 1992, the ratios of the mortality rates (black:white) for PTCA and CABG surgery were among the lowest for the 17 procedures presented. This population-based information could be used in providing patient information and in counseling regarding these procedures. It may be useful in reducing the difference previously cited in the preference by race for coronary artery procedures.

At times, discussions of racial differences in the use of health services attempt to compare the underlying need for service. Unfortunately, for many conditions, there is little information available on the incidence and prevalence of specific illnesses in persons 65 years of age or over to conclude whether the differences reflect, at least in part, differences in need. A prime exception is osteoporosis, which is known to be more prevalent among white beneficiaries, particularly females. Thus, the higher rates of reduction of fracture of the femur and other arthroplasty of the hip among white beneficiaries is to be expected.

In our more detailed analysis of heart procedures (McBean, Warren, and Babish, 1994), we concluded that the estimates of ischemic heart disease derived from the National Health Interview Survey (Adams and Benson, 1991) or from HCFA data could not explain the difference in the rate of heart procedures. Udvarhelyi et al. (1992) and Whittle et al. (1993) analyzed cohorts of persons with incident acute myocardial infarction or other cardiac diagnoses to reduce the disparity in the need for the procedures between the two racial groups. Escarce et al. (1993) cite several references which indicate that the

underlying need for cerebrovascular and joint procedures should be approximately the same in both race groups. Javitt et al. (1991) reported a 2.19 times greater occurrence of surgical treatment of glaucoma among black Medicare beneficiaries compared with white beneficiaries, but cited population-based survey examination data indicating the need for surgery to be four to six times greater in the black population.

To our knowledge, population-based estimates of the prevalence of race-specific hernia, benign prostatic hypertrophy, uterine pathology, and appendicitis in the elderly American population do not exist. If we are to evaluate equity in access across racial and other vulnerable subgroups for specific procedures, a concerted effort is needed to develop knowledge by race about the prevalence of specific diseases as well as reliable methods to translate need into expected procedure rates. However, the preponderance of the evidence in this and other studies indicates that, even after adjustments are made for need, there are systematic differences in major surgical and non-surgical procedure rates for black Medicare beneficiaries compared with white beneficiaries.

Of the procedures we analyzed, the differentials by race for the newer, more highly elective, and referral-sensitive procedures, such as the vascular procedures, hip replacement, knee replacement, and back procedures, were nearly always greater than the differentials by race for older or less elective procedures such as repair of inguinal hernia, appendectomy, mastectomy, prostatectomy, and cholecystectomy. The fact that there are larger differences by race for newer and more elective procedures is consistent with the findings by Wennberg et al. (1982) that geographic variations also tend to be greater for conditions for which there are differences

of opinion among physicians and patients about the outcomes of alternative therapies.

At the same time, studies of Medicare beneficiaries have shown significant rates of inappropriate treatments, which may explain in part the higher rates for white beneficiaries. Brook et al. (1990) estimated that 77 percent of carotid endarterectomies and 36 percent of coronary angiographies performed in the Medicare population were either inappropriate or equivocal. In their analysis, race (defined as white or races other than white) was not a significant variable in explaining the appropriateness of use in their model. Moreover, despite differences in procedure rates by race, Udvarhelyi et al. (1992) found similar 2-year survival rates for black and white Medicare beneficiaries with AMI, clearly indicating that more knowledge is needed about the appropriateness of vascular procedures.

The second part of this study identified hospitalizations for which the procedure rates among black Medicare beneficiaries are greater than among white Medicare beneficiaries. Our first observation is that there are relatively few such procedures. Second, in contrast to the lack of information about difference in disease prevalence for the 17 major procedures, these findings appear to reflect, in part, known differences in disease prevalence in the two race groups. The most frequent principal diagnosis associated with amputation of part of the lower limb is diabetes mellitus (62 percent). Estimates from the Division of Diabetes Translation of the National Centers for Disease Control and Prevention indicate that the prevalence of diabetes among black persons 65 years of age or over is 88 percent greater than among white persons, much lower than the 262 percent greater amputation rate among black beneficiaries in 1992.

The principal diagnosis of prostate cancer appeared in approximately 90 percent of the hospitalizations for both white and black males who underwent bilateral orchiectomy (data not shown). The black:white ratio for the incidence of all prostate cancer is 1.33 (National Cancer Institute, 1990). Bilateral orchiectomy is performed primarily for stage D1 and D2 prostate cancer (disease found in pelvic lymph nodes) (Garnick, 1992). Thus, the higher procedure rate indicates more frequent treatment for advanced prostate cancer in black beneficiaries.

Provisional HCFA data for 1992 indicate that there were 1,758 black persons on chronic renal dialysis for end-stage renal disease (ESRD) per 1 million black beneficiaries, compared with 444 per 1 million white beneficiaries (black:white ratio of 3.96). These data are for beneficiaries of all ages, and the black:white ratio of persons on chronic renal dialysis is greater in beneficiaries less than 65 years of age than in older ones (Eggers, 1994). Thus, the high black:white ratio (5.17) for arteriovenostomy is consistent with the greater prevalence of the underlying disease state.

This portion of the analysis suggests that black persons may be more likely to receive procedures that reflect delayed diagnosis or initial treatment (palliative or advanced-stage cancer treatment), poor or infrequent medical care (diabetes and vascular disease progressing to amputations and skin necrosis/infection), or severe illness for which management of diabetes or hypertension has failed (ESRD). It is generally believed that these four procedures may often be avoided or delayed by comprehensive and continuous medical care.

The 1980s saw the emergence of a trend toward the support of research relating to the outcomes and effectiveness of medical and surgical treatments. The outcomes and effectiveness initiative was stimulated by the large and unexplained variations across geographic areas in treatment practices. The large differences by race in Medicare procedure rates underscore the importance of developing better information on appropriateness, outcomes, and effectiveness of treatments, as well as the importance of developing more information about differences in disease prevalence and the need for care by racial and other subgroups of our population.

There is a broad consensus that access to health care should be available for every person in the Nation. These data for Medicare beneficiaries suggest that health insurance is a necessary but not sufficient condition for assuring that access to care is equitable for all of the population. To be assured that equal access based on need exists in the future American health care delivery system, data and knowledge must be routinely developed about the need for and use of services among each potentially underserved population group.

ACKNOWLEDGMENTS

The authors are appreciative of data development support from Ron Pihoda and Mae Robinson of the Bureau of Data Management and Strategy, HCFA; and the assistance of Leslye Fitterman, Will Kirby, and J. Daniel Babish of the Office of Research and Demonstrations, HCFA.

TECHNICAL NOTE

List of Procedures and Associated ICD-9-CM or DRG Codes

<u>Procedure</u>	<u>ICD-9-CM or DRG Code</u>
Cardiac catheterization	37.21-37.23
Percutaneous transluminal coronary angioplasty	36.0 until 10/1/86 36.01 and 36.02 as of 10/1/86 36.05, 36.01, and 36.02 as of 10/1/87
Coronary artery bypass graft surgery	DRG 106 and 107
Carotid endarterectomy	38.12
Reduction of fracture of the femur	79.05, 79.15, 79.25, and 79.35
Other arthroplasty of the hip	81.6-81.69 until 10/1/89 81.52 as of 10/1/89
Total knee replacement	81.41 until 10/1/89 81.54 as of 10/1/89
Total hip replacement	81.5-81.59 until 10/1/89 81.51 as of 10/1/89
Laminectomy	03.09
Excision of disc	80.5-80.59
Spinal fusion	81.0-81.09
Prostatectomy	60.2-60.6
Open cholecystectomy	51.21-51.22
Repair of inguinal hernia	53.0-53.17
Mastectomy	85.20, 85.22-85.23, and 85.41-85.48
Hysterectomy	68.4-68.7
Appendectomy	47.0
Amputation of part of the lower limb	84.10-84.17
Excisional debridement	86.22
Arteriovenostomy	39.27, 39.42, 39.93, and 39.94
Bilateral orchiectomy	62.41

REFERENCES

- Adams, P.F., and Benson, V.: Current Estimates From the National Health Interview Survey 1989, National Center for Health Statistics. *Vital and Health Statistics* 10(176), 1990.
- Adams, P.F., and Benson, V.: Current Estimates From the National Health Interview Survey 1990, National Center for Health Statistics. *Vital and Health Statistics* 10(181), 1991.
- Bergner, L. and Yerby, A.S.: Low Income and Barriers to the Use of Health Services. *New England Journal of Medicine* 278:541-546, 1968.
- Brook, R.H., Park, R.E., Chassin, M.R., et al.: Predicting the Appropriate Use of Carotid Endarterectomy, Upper Gastrointestinal Endoscopy and Coronary Angiography. *New England Journal of Medicine* 323(17):1173-1177, 1990.
- Eggers, P.: Office of Research, Health Care Financing Administration. Personal Communication. 1994.
- Escarce, J.J., Epstein, K.R., Colby, D.C., et al.: Racial Differences in the Elderly's Use of Medical Procedures and Diagnostic Tests. *American Journal of Public Health* 83:948-954, 1993.
- Garnick, M.B.: Urologic Cancer. *Scientific American Medicine*, Rubenstein, E., and Federman D.D., eds. New York, NY. Scientific American, 1992.
- Health Care Financing Administration. *Health Care Financing Special Report: Hospital Data by Geographic Area for Aged Medicare Beneficiaries: Selected Procedures, 1986, Volume 2*. HCFA Pub. 03301. June 1990.
- Health Care Financing Administration. *Monitoring Utilization of and Access to Services for Medicare Beneficiaries Under Physician Payment Reform. Report to Congress, FY 1992*. Health Care Financing Administration. Baltimore, MD. 1992.
- Health Care Financing Administration. *Monitoring Utilization of and Access to Services for Medicare Beneficiaries Under Physician Payment Reform. Report to Congress, FY 1993*. Health Care Financing Administration. Baltimore, MD. 1993.
- Health Care Financing Administration. *Monitoring Utilization of and Access to Services for Medicare Beneficiaries Under Physician Payment Reform. Report to Congress, FY 1994*. Health Care Financing Administration. Baltimore, MD. Forthcoming.
- Institute of Medicine (U.S.): Committee on Monitoring Access to Personal Health Care Services. *Access to Health Care in America*. National Academy Press. 1993.
- Javitt, J.J., McBean, A.M., Nicholson, G.A., et al.: Undertreatment of Glaucoma Among Black Americans. *New England Journal of Medicine* 325(20):1418-1422. 1991.
- Kahn, H.A., and Sempos, C.T.: *Statistical Methods in Epidemiology*. New York, NY. Oxford University Press, 1989.
- Long, S.H., and Settle, R.F.: Medicare and the Disadvantaged Elderly: Objectives and Outcomes. *The Milbank Quarterly* 62:609-656, 1984.
- Maynard, C., Fisher, L.D., Passamani, E.R., and Pullum, T.: Blacks in the Coronary Artery Surgery Study (CASS): Race and Clinical Decision Making. *American Journal of Public Health* 76:1446-1448. 1986.
- McBean, A.M., Warren, J.L., and Babish, J.D.: Continuing Differences in the Rates of Percutaneous Transluminal Coronary Angioplasty and Coronary Artery Bypass Graft Surgery between Black and White Medicare Beneficiaries. *American Heart Journal* 127:287-295, 1994.
- Myers, R.J.: Medicare. McCahan Foundation, Bryn Mawr, PA. 1970.
- National Cancer Institute: *Cancer Statistics Review 1973-87*. Gloeckler, L.A., Hankey, B. F., and Edwards, B. K.; eds. U.S. Department of Health and Human Services; National Institutes of Health; NIH Pub. 90-2789. National Cancer Institute. Bethesda, MD. 1990.
- Rice, T., and McCall, N.: The Extent of Ownership and the Characteristics of Medicare Supplemental Policies. *Inquiry* 22:188-200. 1985.
- Social Security Administration, Office of Research and Statistics: *Medicare: Health Insurance for the Aged, 1967*, Section 4.1: Short-Stay Hospital Utilization. Department of Health, Education and Welfare. Washington, DC. 1975.
- Udvarhelyi, I.S., Gatsonis, C., Epstein, A.M., et al.: Acute Myocardial Infarction: Process of Care and Clinical Outcomes. *Journal of the American Medical Association* 268(18):2530-2536, 1992.
- Wennberg, J.E., Barnes, B.A., and Zubkoff, M.: Professional Uncertainty and the Problem of Supplier-Induced Demand. *Social Science and Medicine* 16:811-824, 1982.
- Wenneker, M.B., and Epstein, A.M.: Racial Inequalities in the Use of Procedures for Ischemic Heart Disease in Massachusetts. *Journal of the American Medical Association* 261:253-257, 1989.
- Whittle, J., Conigliaro, J., Good, C.B., et al. : Racial Differences in the Use of Invasive Cardiovascular Procedures on the Department of Veterans Affairs Medical System. *New England Journal of Medicine* 329(9):621-627, 1993.

Reprint Requests: Marian Gornick, Office of Research and Demonstrations, 2504 Oak Meadows Building, 6325 Security Boulevard, Baltimore, Maryland 21207.