Absence of Sex Differences in the Evaluation of Patients Hospitalized for Transient Ischemic Attacks

K. Patricia McGann, MD, MSPH; Gail S. Marion, PA-C; Marcia B. Szewczyk, MD; and Stephen W. Davis, MA
Winston-Salem, North Carolina

Background. Sex has been shown to affect the extent of evaluation and treatment of patients with coronary artery disease. This study investigates potential differences in the evaluation of hospitalized men and women with transient ischemic attacks to determine whether a similar bias exists.

Methods. The 1989 MedisGroups comparative database was used to analyze a convenience sample consisting of all family and internal medicine patients with the primary admission diagnosis-related group (DRG) of "transient ischemic attack."

Results. Women comprised 1933 of the 3165 admissions. The mean age for women was 1.88 years older than for men ($P<.01$). Women were three times more likely to reside in a nursing home before admission ($P<.01$), but had a lower prevalence of dementia ($P<.05$). The 1232 men had a higher severity of illness score at admission ($P<.05$), and were 5.3% more likely to be admitted to a teaching hospital than women ($P<.01$). Men were also more likely than women to be admitted to large hospitals ($P<.01$). There were no differences between sexes in the use of cranial computed tomography, carotid or cardiac Doppler, or carotid arteriography. Adjusted means for hospital charges, morbidity, and mortality did not differ between sexes, but length of stay was longer by 1.5 days for women compared with men ($P<.01$).

Conclusions. In-hospital evaluation of elderly patients with transient ischemic attacks did not differ significantly between men and women. This finding does not exclude the possibility of a difference in workup for men as compared with women in the ambulatory management of this condition.

Key words. Sex; bias (epidemiology); men; women; cerebral ischemia, transient.
(*J Fam Pract 1994; 39:134-139*)

Sex affects the incidence, expression, and progression of various disease processes. Perhaps the most well known of these is atherosclerosis. Cohort studies of coronary and cerebral vascular disease have provided a wealth of knowledge concerning the natural history of these entities.[1-3] In recent years, it has been discovered that sex influences not only the disease process itself but also the physician's management of patients who have coronary artery disease. In particular, recent studies have shown that men are more aggressively evaluated and treated for myocardial ischemia than women.[4-6]

Transient ischemic attacks (TIAs), which are defined as cerebral vascular events in which clinical neurologic deficits resolve within 24 hours, resemble angina pectoris in that ischemia occurs without permanent damage to the affected organ. This demonstrates a preinfarction warning period and thus a parallel between coronary and cerebral ischemic disease. The issue that prompted this preliminary investigation was whether there are sex biases similar to those found in the approach to coronary artery disease in the evaluation and management of patients with cerebral artery disease.

Morbidity and mortality from cerebral infarcts appear to be similar in men and women, as does the decline in mortality from strokes over the last 25 years.[7] The

Submitted, revised, March 16, 1994.

From the Department of Family and Community Medicine, Bowman Gray School of Medicine of Wake Forest University, Winston-Salem, North Carolina. Requests for reprints should be addressed to K. Patricia McGann, MD, MSPH, Department of Family and Community Medicine, Bowman Gray School of Medicine of Wake Forest University, Medical Center Blvd, Winston-Salem, NC 27157-1084.

ISSN 0094-3509

incidence of TIAs varies among patients with regard to age, sex, and geographical location. It appears to be higher for men in younger age groups but is nearly the same for both sexes in patients over 65 years of age. The incidence increases with age and varies by area of the country from a rate of 23 to 268 per 100,000.[8–10]

Nonsurgical therapy that consists of risk-factor control and daily platelet-aggregation inhibition therapy is the same for patients of both sexes, although efficacy of platelet inhibition may be higher for men than for women.[11] However, it is not known whether physicians' approach to evaluation and management is the same for men and women. Specifically, we do not know if the same tests are ordered at the same frequency for women as for men who present with TIAs; nor do we know if treatment is equally aggressive in patients of both sexes.

The present study was undertaken to determine whether the in-hospital evaluation of patients aged 65 years and older with an admission diagnosis-related group (DRG) of TIA differed between men and women when controlling for pertinent patient variables, severity of illness, and hospital characteristics shown to be important in previous studies of quality of care. Patient variables included age,[12] illness severity at admission,[13] residence in a nursing home,[14] socioeconomic status as defined by Medicaid insurance coverage,[12] and the type of physician chosen as the attending (family physician or internist).[15–17] The presence of dementia was included because it may influence the decision for aggressive treatment. Race, though important, was not available for comparison. Hospital characteristics known to influence outcome and cost included geographic region,[18] total number of beds,[19,20] payroll expenses,[20] and medical school affiliation.[19,20] The extent to which certain technologies are available influences their use as well.[21] Therefore, available information regarding the presence of equipment and facilities thought to represent the availability of sophisticated technology were included in the description of the hospitals. The extent of in-hospital evaluation was determined by the use of cranial tomography, cardiac and carotid ultrasound, and carotid arteriography.

Methods

For this study, we used the MedisGroups quality assurance system, which compares data from any of the several hundred participating hospitals with the compiled data of the MedisGroups comparative database. Each participating hospital abstracts the chart of every admission. When these abstracts have maintained the level of 95% accuracy for 1 year, they are included in the MedisGroups database. Only the hospitals reviewing admissions from all hospital departments are included.

The 1989 MedisGroups comparative database, which was used in this study, consists of all admissions to a subset of 40 hospitals, balanced for geographical region, size, and type of hospital. Of the 40 hospitals, 20% have fewer than 200 beds, 42.5% have between 200 and 400 beds, 27.5% have between 400 and 800 beds, and 10% have more than 800 beds; the range is 73 to 1461 beds. Forty-five percent are defined as teaching hospitals, ie, approved to participate in residency training by the Accreditation Council for Graduate Medical Education, and 27.5% are members of the Council of Teaching Hospitals. The hospitals are located throughout the country, with a high concentration in the Middle Atlantic States.

Severity of illness is defined in this system as the potential for major organ failure during the hospitalization. Severity scores are determined for each patient based on his or her condition at the time of admission as measured by indicators called "key clinical findings" and calculated by algorithm. The patients are then placed in admission severity groups with scores ranging from zero to four; scores of four are assigned to the most seriously ill patients. Physical findings relevant to the neurologic system that are included in the determination of admission illness severity include level of consciousness, orientation, papilledema, seizures, and cranial nerve, motor, gait, and sensory deficits. Physical findings from other organ systems, as well as laboratory and radiographic test results, are also included in the determination of admission illness severity scores. Admission illness severity scores are determined retrospectively by chart review on day 3 of the hospitalization to allow time for all admission diagnostic reports to be entered in the charts.

The system measures outcome as morbidity, major morbidity, and mortality. Morbidity is also determined by key clinical findings, and patients are placed in categories defined as nonmorbid, morbidity, and major morbidity. For example, a P_{CO_2} of less than 50 mm Hg is considered nonmorbid, a P_{CO_2} of 50 to 70 mm Hg is considered morbidity, and a P_{CO_2} of greater than 70 mm Hg is considered major morbidity. The outcome categories are determined by chart review on designated days after admission, usually day 8. If the patient is discharged before day 8, no morbidity review is done. If the patient dies or is transferred to an institution of a higher level of care, a morbidity review is done regardless of when the patient was discharged. More detailed descriptions of this database can be found elsewhere.[13,15]

We studied a convenience sample of all patients of family and internal medicine physicians with a primary admitting DRG of TIA in patients aged 65 years and older in the database. Mean values for patient age and admis-

sion severity scores, as well as hospital variables of bed total and payroll, were calculated and compared using a two-tailed *t* test for independent means. Chi-square was used to compare dichotomous patient variables, such as residence in a nursing home, Medicaid insurance, family physician attending, morbidity (combined morbidity and major morbidity groups), and mortality rate, as well as hospital characteristics such as availability of cranial computed tomography scans.

Analysis of covariance equations were used to compare mean hospital charges and mean length of stay between men and women while controlling for variables found to be significant in the initial analysis. These variables included patient characteristics of age, admission from a nursing home, and severity of illness, and hospital characteristics of bed total, yearly payroll expenses, region located, and teaching hospital status. Logistic regression equations were used to calculate an adjusted odds ratio for morbidity (combined morbidity and major morbidity groups) and mortality, while controlling for the same variables as well as interactions between sex and age, admission from a nursing home, and sex, admission illness severity score, and age. Length of stay was analyzed both by including and excluding patients who were discharged to a nursing home.

Results

There were 3165 patients ranging in age from 65 to 104 years admitted to the hospitals for TIAs. In the database, TIAs constituted the 9th most common admission for internists and the 10th most common for family physicians. Of these patients, 1232 were men and 1933 were women. The mean age of the women was 1.88 years older than that of the men ($P<.01$). Women were more likely to reside in a nursing home ($P<.01$) but had a lower prevalence of dementia and mean admission illness severity score ($P<.05$) than men. The percentage of patients having Medicaid insurance and of patients admitted by family physicians did not differ significantly between sexes (Table 1).

Men were more likely to be admitted to hospitals with a higher average bed count, higher annual payroll expense, and membership in the Council of Teaching Hospitals ($P<.01$). The hospitals located in the South (Region 5) had relatively more men than women ($P<.01$). Men and women were admitted to hospitals with comparable technology (Table 2).

Among women, the unadjusted mean length of stay for the hospitalization was 0.8 days longer than men ($P<.01$) and morbidity was less by 1.5% ($P<.01$) than among men. Major morbidity, mortality, average costs, and the use of sophisticated technology did not differ between sexes (Table 3).

Table 1. Baseline Patient Characteristics in Men and Women Hospitalized with Transient Ischemic Attacks

Patient Characteristic	Men	Women	Range
Mean age (y)	75.60	77.48*	65–104
Mean admission severity score	1.67	1.60†	0–4‡
Resides in nursing home (%)	0.7	2.1*	
Has Medicaid insurance (%)	0.2	0.2	
Was admitted by family physician (%)	31.7	33.4	
Has dementia (%)	0.3	0.0†	

*P<.01.
†P<.05.
‡*An admission severity score of 0 was assigned to patients with the least serious illness and a score of 4 to the most seriously ill.*

Adjusted means for total hospital charges did not differ significantly between men and women, but adjusted mean length of stay was 1.5 days longer for women than for men ($P<.01$), which increased slightly when controlling for discharge to a nursing home. The adjusted odds ratio for combined morbidity and major morbidity was not significant at 0.89 (95% confidence interval [CI]= 0.737–1.080), nor was the adjusted odds ratio for mortality significant at 0.89 (95% CI=0.634 to 1.263) for women as compared with men (Table 4).

Discussion

In the 1989 MedisGroups comparative database, women constituted 61% of the 3165 patients aged 65 and older who were admitted to the hospital for TIAs. These women were 1.88 years older and less ill on the average than the men in the same age group admitted for the same condition. Women were more likely to be admitted from nursing homes and to smaller and nonteaching hospitals

Table 2. Characteristics of the Hospitals to Which Men and Women with Transient Ischemic Attacks Were Admitted

Hospital Characteristic	Men	Women
Medical school affiliation (%)	59.6	56.6
Teaching hospital (%)	38.9	33.6*
Joint commission accredited (%)	100.0	100.0
Intensive care unit available (%)	100.0	100.0
Ultrasound available (%)	100.0	100.0
Computed tomography available (%)	98.7	98.5
Cardiac catheterization available (%)	67.0	66.3
Skilled nursing unit available (%)	22.0	19.2
Located in Region 5 (southern states) (%)	24.8	20.7
Total number of beds (mean)	599	552*
Annual payroll expenses ($ millions)	49.1	44.5

*P<.01.

Table 3. Unadjusted Hospital Charges, Length of Stay, Patient Outcome, and Technology Use for Men and Women Hospitalized with Transient Ischemic Attacks

Variable	Men	Women
Mean basic charge per admission ($)	8314	8392
Mean ancillary charge per admission ($)	5379	5209
Mean length of stay (d)	10.15	10.95*
Morbidity (%)	15.0	13.5*
Major morbidity (%)	7.6	6.5
Mortality (%)	5.2	4.5
Received echocardiogram (%)	4.9	5.4
Received carotid Doppler (%)	5.5	6.5
Received cranial CT (%)	20.0	20.5
Received arteriography (%)	7.8	6.6

*$P<.01$.
CT denotes computed tomography scan.

than were their male counterparts. After adjusting for patient mix, severity of illness, and hospital characteristics, there were no differences in morbidity, mortality, total hospital charges, or the rates of relevant tests and procedures. Adjusted length of stay was significantly different, with women remaining in the hospital longer than men.

These findings are consistent with what we would hope for the health care system, and with other recent research, which shows that, after controlling for important patient variables, the in-hospital experiences of elderly men and women admitted for congestive heart failure, acute myocardial infarction, pneumonia, and cerebrovascular accident had greater similarities than differences.[22] The longer length of stay for women cannot be explained by greater age, morbidity experienced in the hospital, nor admission from or discharge to a nursing home. Any explanation is purely hypothetical. There may be subtle differences in admission illness severity scores or functional status that are not measured by this database that have a bearing on length of hospital stay. Alternatively, women returning home after a hospitalization in general may be required to assume more responsibility for their own care or the care of others than are men, and therefore, their discharge from the hospital may be appropriately delayed until they achieve greater levels of recovery.

There are limitations to this study. The diagnosis of TIA in these patients was not verified. The records used for comparison are for patients admitted for TIA, but not necessarily discharged with a clear diagnosis of TIA. This lack of diagnostic criteria may be seen as a disadvantage, but it does not necessarily preclude the distillation of worthwhile information. The diagnosis of TIA presumes the resolution of symptoms over a 24-hour period. It cannot always be known at the time of admission if these diagnostic criteria will be met, or if some other condition will emerge as the cause of the presenting complaint. It may be more relevant to see how physicians proceed in their evaluation before the diagnosis is clear, especially in this special subset of patients whose condition is considered serious enough to warrant hospitalization.

Table 4. Outcome Variables Adjusted for Patient Mix and Hospital Characteristics

Characteristic	Men	Women	*P* Value
Mean total hospital charges per admission, $	13,017	14,325	NS
Mean length of stay, d	9.85	11.34	<.01
Combined morbidity, OR (95% CI)	1.0	0.89 (0.737–1.080)	
Mortality, OR (95% CI)	1.0	0.89 (0.634–1.263)	

OR denotes odds ratio; CI, confidence interval.

In addition, the procedures listed in the database reflect only those performed after admission and before discharge. It is likely that patients received testing before and after their stay in the hospital, in which case it would not appear in this database. This possibility is strongly suggested by the relatively low proportion of patients receiving carotid Doppler and cranial CT studies.

Lack of information about race is an important deficiency. This characteristic has been shown to influence morbidity and mortality in some disease states,[23] and we do not know with certainty whether there was a difference in this characteristic between men and women experiencing TIAs. However, both men and women were drawn from the same regions of the country, and significant differences were controlled for in the analyses of covariance and logistic regressions. There is no reason, therefore, to expect a higher proportion of black men than black women, which would confound the results.

Self-selection of the hospitals for participation in this quality-assurance database may affect the outcome of this study. It is possible that these hospitals are not a representative sample of all hospitals, and that these data do not reflect the actual state of care in the country as a whole.

The validity of the MedisGroups algorithm for estimating severity of illness is fundamental to this study, and it has been shown to predict morbidity and mortality to some extent.[13,14,24,25] However, in assessing the MedisGroups system, several factors should be considered. The system is proprietary, and the complete algorithm is not available for unrestricted, independent clinical scrutiny. Many key clinical findings are procedural in nature, and the system measures immediate severity rather than the extent of underlying disease. This would be particularly important in diseases such as intermediate coronary syndrome and transient ischemic attacks in which physical findings can be normal or minimally abnormal although the patient is on the edge of medical disaster. Some feel that MedisGroups does not fairly adjust for interhospital

case mix difference in patients admitted with acute myocardial infarction.[26,27] In addition, the system does not include morbidity that occurs in patients who are discharged alive before 8 days of hospitalization.

The MedisGroup system, however, was designed to compare quality of care. Based on the logical premise that the higher the severity of illness score, the greater the potential for major organ failure, the system has been shown to predict patient outcome in a large group, with a mortality rate of 60% in patients admitted with the highest severity score, compared with only a 1% mortality rate in patients with the lowest two scores.[13] MedisGroups data have also been used for validation of a prognostic index for pneumonia.[24] Even with its shortcomings it represents a reasonable estimate of illness severity and is therefore an acceptable system for comparing quality among groups.

Since the data reflect only in-hospital care for patients, there may be a significant sex bias that is manifested only in the outpatient setting. The studies on sex bias for coronary artery disease show a smaller difference for inpatient[28–30] than for outpatient[4] management. A study design other than the one employed here would be required to determine whether such a difference does exist.

There may be a bias in hospitalized patients that is not evident in this investigation. We did not have access to the results from carotid arteriography performed on the patients in the database. It is possible that knowledge of these results would reveal a bias in referral to endarterectomy toward one group or the other, since the extent of atherosclerotic lesions would define which patients were actually appropriate for surgical intervention. The increased likelihood of men being admitted to teaching hospitals may also represent a subtle bias.

The study reported here represents a first step in the search for sex bias in the evaluation of patients with suspected TIAs. It therefore contributes important information to the question of variations in care between men and women. It shows a longer length of stay for women, but no significant differences by sex in medical evaluation or outcome using an objective measure for a large number of hospitalized elderly patients with TIAs. Perhaps the bias found previously in the management of coronary artery disease is specific to that condition and does not reflect a widespread attitude among medical practitioners toward men and women. Perhaps a bias toward more aggressive management of TIAs in men is limited to patients under 65 years of age. Perhaps sex bias toward patients with cerebral vascular disease occurs only in the outpatient setting. These results suggests that future investigation into the presence or absence of sex bias in the management of TIAs should be focused on the outpatient setting.

Acknowledgment

We are grateful to Mediqual Systems, Inc, Westborough, Mass, for allowing us to use their database for our research.

References

1. Lerner DJ, Kannel WB. Patterns of coronary heart disease morbidity and mortality in the sexes: a 26-year follow-up of the Framingham population. Am Heart J 1986; 111:383–90.
2. European Stroke Prevention Study Group. European stroke prevention study: principal end points. Lancet 1987; 2:1351–4.
3. Ford SC, Howard VJ, Howard G, et al. The sex difference in manifestation of carotid bifurcation disease. Stroke 1986; 17:877–81.
4. Tobin JN, Wassertheil-Smoller S, Wexler JP. Sex bias in considering coronary bypass surgery. Ann Intern Med 1987; 107:19–25.
5. Kahn SS, Nessim S, Gray R, et al. Increased mortality of women in coronary artery bypass surgery: evidence for referral bias. Ann Intern Med 1990; 112:561–7.
6. Wenger NK. Gender, coronary artery disease, and coronary bypass surgery [editorial]. Ann Intern Med 1990; 112:557–8.
7. Modan B, Wagener DK. Some epidemiologic aspects of stroke: mortality/morbidity trends, age, sex, race, socioeconomic status. Stroke 1992; 23:1230–6.
8. Dennis MS, Bamford JM, Sadercock PAG, et al. Incidence of transient ischemic attacks in Oxfordshire, England. Stroke 1989; 20: 333–9.
9. Whisnant JP, Melton LJ, Davis PH, et al. Comparison of case ascertainment by medical record linkage and cohort follow-up to determine incidence rates for transient ischemic attacks and stroke. J Clin Epidemiol 1990; 43:791–7.
10. Lai SM, Alter M, Friday G, et al. Transient ischemic attacks: their frequency in the Lehigh Valley. Neuroepidemiology 1990; 9:124–30.
11. Sivenious J, Laakso M, Penttila IM, et al. The European Stroke Prevention Study: results according to sex. Neurology 1991; 41: 1189–92.
12. Hainer BL, Lawler FH. Comparison of critical care provided by family physicians and general internists. JAMA 1988; 260:354–8.
13. Lezzoni LI, Meskowitz MA. A clinical assessment of MedisGroups. JAMA 1988; 260:3159–63.
14. Zweig S, Lawhorne L, Post R. Factors predicting mortality in rural elderly hospitalized for pneumonia. J Fam Pract 1990; 30:153–9.
15. McGann KP, Bowman MA. A comparison of morbidity and mortality for family physicians' and internists' admissions. J Fam Pract 1990; 31:541–5.
16. Kravitz RL, Greenfield S, Rogers W, et al. Differences in the mix of patients among medical specialties and systems of care. Results from the Medical Outcomes Study. JAMA 1992; 267:1617–23.
17. Greenfield S, Nelson EC, Zubkoff M, et al. Variations in resource utilization among medical specialties and systems of care. Results from the Medical Outcomes Study. JAMA 1992; 267:1624–30.
18. Welch WP, Miller ME, Welch HG, et al. Geographic variation in expenditures for physicians' services in the United States. N Engl J Med 1993; 328:621–7.
19. Keeler EB, Rubenstein LV, Kahn KL, et al. Hospital characteristics and quality of care. JAMA 1992; 268:1709–14.
20. Hartz AJ, Krakauer H, Huhn EM, et al. Hospital characteristics and mortality rates. N Engl J Med 1989; 321:1720–5.
21. Every NR, Larson EB, Litwin PE, et al. The association between on-site cardiac catheterization facilities and the use of coronary angiography after acute myocardial infarction. N Engl J Med 1992; 329:540–51.
22. Pearson ML, Kahn KL, Harrison MS, et al. Differences in quality of care for hospitalized elderly men and women. JAMA 1992; 268: 1883–9.
23. Becker LB, Han BH, Meyer PM, et al. Racial differences in the incidence of cardiac arrest and subsequent survival. N Engl J Med 1993; 329:600–6.

24. Fine MJ, Singer DE, Hanusa BH, et al. Validation of pneumonia prognostic index using the MedisGroups comparative hospital database. Am J Med 1993; 94:153–9.
25. Iezzoni LI, Ash AS, Coffman G, Moskowitz MA. Admission and mid-stay MedisGroups scores as predictors of death within 30 days of hospital admission. Am J Public Health 1991; 81:74–8.
26. Blumberg MS. Biased estimates of expected acute myocardial infarction mortality using MedisGroups admission severity groups. JAMA 1991; 265:2965–70.
27. Bias estimates of mortality using MedisGroups [letter]. JAMA 1991; 266:2704–5.
28. Green LA, Ruffin MT. Differences in management of suspected myocardial infarction in men and women. J Fam Pract 1993; 36:389–93.
29. Steingart RM, Packer M, Hamm P, et al. Sex differences in the management of coronary artery disease. N Engl J Med 1991; 325:226–30.
30. Ayanian JZ, Epstein AM. Differences in the use of procedures between women and men hospitalized for coronary artery disease. N Engl J Med 1991; 325:221–5.