
Gender bias in cardiovascular advertisements

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Abstract

Rationale Women with cardiovascular disease are treated less aggressively than men. The reasons for this disparity are unclear. **Pharmaceutical advertisements** may influence physician practices and patient care. **Aims and objective** To determine if female and male patients are equally likely to be featured in cardiovascular advertisements. **Methods** We examined all cardiovascular advertisements from US editions of general medical and cardiovascular journals published between 1 January 1996 and 30 June 1998. For each unique advertisement, we recorded the total number of journal appearances and the number of appearances in journals' premium positions. We noted the gender, age, race and role of both the primary figure and the majority of people featured in the advertisement. **Results** Nine hundred and nineteen unique cardiovascular advertisements were identified of which 254 depicted a patient as the primary figure. A total of 20% [95% confidence interval (CI) 15.3–25.5%] of these advertisements portrayed a female patient, while 80% (95% CI 74.5–84.7%) depicted a male patient, $P < 0.0001$. Female patient advertisements appeared 249 times (13.3%; 95% CI 8.6–18.9%) while male patient advertisements appeared 1618 times (86.7%; 95% CI 81.1–91.4%), $P < 0.0001$. Female patient advertisements also had significantly fewer mean appearances than male patient advertisements in journals' premium positions (0.82 vs. 1.99, $P = 0.02$). Similar results were seen when the advertisements were analysed according to predominant gender. **Conclusions** Despite increasing emphasis on cardiovascular disease in women, significant under-representation of female patients exists in cardiovascular advertisements. Physicians should be cognizant of this gender bias.

Introduction

Cardiovascular disease is the most common cause of death in both women and men in North America (Mosca *et al.* 1997). The disease has been studied

extensively with research focusing mainly on men and results being extrapolated to women (Cotton 1990). However, a growing number of clinical and epidemiological studies have shown that cardiovascular disease has gender-specific features. Women

and men appear to differ with respect to pathophysiologic processes and clinical presentations (Steingart *et al.* 1991; Mohri *et al.* 1998). Moreover, the gender, age, and race of a patient seem to influence the recommendations of physicians independent of other risk factors (Armitage *et al.* 1979; Steingart *et al.* 1991; Schulman *et al.* 1999; Canto *et al.* 2000). Gender-based differences in the use of aspirin, beta-blockers, and thrombolytic therapies have been reported (Chandra *et al.* 1998). Studies have also shown that women are referred both later and less frequently for cardiac catheterization and coronary artery bypass surgery (Ayanian & Epstein 1991; Steingart *et al.* 1991). The cause of these disparities in physician practices remains unclear, and may reflect a complex combination of biological and sociological differences, as well as patient preferences.

Physicians often rely on pharmaceutical advertisements in medical journals as a major source of information (Avorn *et al.* 1982; Haayer 1982). Recent data suggest that pharmaceutical advertisements influence physician practices and patient care. Indeed, the marketing budgets of the drug industry have been estimated to be up to 40% of all revenues (Angell 2000). Over a 10-year period, Krupka & Vener (1985) examined over 500 advertisements in two prominent American medical journals and concluded that a link existed between the most common drug advertisements and the leading prescriptions filled.

In recent years, greater attention has been paid to potential gender and racial bias in pharmaceutical advertisements (Seibel & Levitz 1988; Tieze & Smith 1990). Previous small studies have examined the effect of gender stereotypes in drug advertising upon physicians' prescribing patterns and have suggested that advertisements may be biased with respect to gender (Mcree *et al.* 1974; Mant & Darroch 1975). Advertisements for non-psychiatric conditions appear to predominantly feature men while advertisements for psychogenic medications seem to focus on women. For example, Prather & Fidell (1975) examined 423 advertisements from four medical journals between 1968 and 1972 and found that the majority of female advertisements were for psychogenic medications. Thompson (1979) examined 486 advertisements from two leading American medical journals published in 1975 and found that, after excluding gender-specific conditions, 73% of

the advertisements for non-psychiatric conditions featured men. None of the advertisements for angina or hyperlipidaemia depicted women.

Women's cardiovascular health has received more attention in recent years and there has been a greater emphasis on including women in cardiovascular clinical trials (Harris & Douglas 2000). It is unclear whether this increased awareness of cardiovascular disease in women has translated into more appropriate gender representation in advertising. Our project was designed to examine whether gender differences currently exist in the representation of women and men in cardiovascular drug and device advertisements.

Methods

Selection of cardiovascular advertisements

We reviewed all cardiovascular advertisements printed between 1 January 1996 and 30 June 1998 in US editions of general medicine and cardiovascular journals with an impact factor of greater than or equal to 1.00, according to the *1996 Science Citation Index* (1996 Science Citation Index Journal Citation Reports 1997). Journals were identified by reviewing the 'Medicine, General and Internal' and 'Cardiac & Cardiovascular Systems' sections in the Index. Fifty journals met these inclusion criteria of which 34 journals (20 general medicine journals and 14 cardiovascular journals) carried cardiovascular advertisements. We included advertisements that featured drugs for coronary artery disease, hypertension, congestive heart failure, hyperlipidaemia, arrhythmia, and devices for cardiovascular interventional procedures or surgeries. We excluded advertisements that were non-English, for paediatric populations only, or for a gender-specific condition (e.g. benign prostatic hypertrophy and hypertension). We only included advertisements portraying people (both photos and caricatures).

Primary and secondary outcomes

Our primary outcome was to determine whether the frequencies of women and men appearing in medical journal cardiovascular advertisements differed. Specifically, we asked the following:

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- 1 Are female and male patients equally likely to be featured in advertisements?
 - 2 Are female and male patients equally likely to be featured as the primary figure in advertisements?
 - 3 Are female and male patients equally likely to be featured in advertisements for different cardiovascular disorders?

Our secondary outcomes were to establish whether there were differences in age and racial representations of female and male patients appearing in medical journal cardiovascular advertisements.

Data collection

Before the study, two of the authors (S.B.A. and A.M.C.) devised a data extraction form based on a pilot sampling of 30 cardiovascular advertisements. Two psychologists with media and advertising backgrounds reviewed the data abstraction form to ensure that no significant variables were omitted. For each unique advertisement, we assigned a specific identifier and collected the following data: the number of times it appeared in each journal, the number of journals in which it appeared, the number of pages it occupied and the number of times it occupied a premium position. Based on a survey of advertising rates for the journals included in our study, we define premium positions to be the back cover, the inside front cover and opposite the table of contents. We also collected data on the advertised product (drug class, device type and specific condition for indicated use); and whether the advertisement cited published guidelines or a clinical study regarding product efficacy or side effects. The gender of the patients in the quoted guidelines or study population was noted as well.

Advertisement classification

Primary figure was defined as the person who was centred or filled the greater part of the advertisement, was facing the camera or was more clearly or closely profiled. If we were not able to discern the gender of the primary figure, the gender was classified as 'unknown'. We also noted the role (patient, other, or unknown), age (<35 years, 35–55 years, 56–70 years, >70 years or unclear) and race (white, black, Hispanic, Asian or other) of the primary

figure. Lastly, we recorded the activity of the primary figure as either active (e.g. skiing) or passive (e.g. reading). We also categorized the advertisement according to the gender of the majority of people featured in the advertisement. We characterized the advertisement as predominantly male if greater than half of the people were men, predominantly female if greater than half of the people were women, or 'neutral' if the proportions were equal. We classified the gender of the advertisement as 'unknown' if we were not able to discern the gender. The age and race of all people shown were classified in a similar fashion to the primary figure.

Interrater reliability

All cardiovascular advertisements were reviewed and classified by one author (S.B.A.) using our standard data abstraction sheet. Two other authors (S.L.G. and H.T.S.), one female and one male, independently reviewed and classified a 10% random sample of all the advertisements (93 advertisements). Agreement on the classification of the advertisements was assessed with Cohen's Kappa reliability coefficients. All were well above the accepted reliability rate (Landis & Koch 1977). The multirater (three raters) reliabilities were as follows: predominant gender of advertisement 0.878 [95% confidence interval (CI) 0.796–0.960], gender of primary figure 0.787 (95% CI 0.702–0.872), race of primary figure 0.827 (95% CI 0.735–0.918), age of primary figure 0.713 (95% CI 0.644–0.782), activity of primary figure 0.738 (95% CI 0.655–0.821), role of primary figure 0.837 (95% CI 0.748–0.925) and portrayal of primary figure 0.905 (95% CI 0.799–1.0). We also calculated two-way interrater reliabilities. Female-to-female reliabilities were similar to male-to-female reliabilities.

Statistical analysis

For analysis of characteristics of unique advertisements, we assumed that they were statistically independent. We computed confidence intervals for the proportion of advertisements portraying female and male patients using the Wilson method (Agresti & Coull 1998). We used χ^2 -tests to compare the proportions of female and male advertisements with

characteristics such as whether they were study-based, or whether they featured minorities.

For analysis involving advertisement appearances, we used the Wilcoxon rank-sum test (Altman 1991) to compare the number of advertisement appearances portraying female and male patients, and a logistic regression model which adjusted for overdispersion to compare female and male advertisement appearances occupying premium positions. The adjustment for overdispersion was made by inflating the standard errors of the log-odds ratios by an estimated scale parameter (McCullagh & Nelder 1989). To calculate *P*-values and confidence intervals, we used bootstrap techniques to account for the non-independence of observations (Efron & Tibshirani 1993). To test the hypothesis that male advertisements and female advertisements appeared in equal proportion, we first calculated proportions on 2000 data sets resampled under the null hypothesis that neither number of advertisements nor number of appearances per advertisement were associated with gender. We then obtained an approximate *P*-value by comparing the observed proportion of female advertisement appearances to this null hypothesis distribution. To obtain a confidence interval for the proportion of female advertisement appearances, we resampled the pair (gender, number of occurrences), from its empirical distribution and computed the bootstrap distribution of this proportion. A similar approach was taken for the comparison between male and female advertisement appearances for characteristics such as the citation of guidelines.

Results

Our sample included 919 unique advertisements with a total of 6541 appearances in the journals examined.

Four hundred and twelve advertisements (44.8%) depicted people, 3 (0.3%) depicted gender-associated objects and 504 (54.8%) depicted neither. Among advertisements that portrayed people, 331 (80.3%) were judged to be patients with a total of 2235 appearances.

Gender

Of the 331 unique advertisements portraying patients, 254 advertisements had a discernible patient primary figure. Fifty-one of these advertisements (20.1%, 95% CI 15.3–25.5%) had a female primary figure while 203 (79.9%, 95% CI 74.5–84.7%) had a male primary figure, $P < 0.0001$. Female primary figure advertisements appeared 249 times (13.3%, 95% CI 8.6–18.9%) while male primary figure advertisements appeared 1618 times (86.7%, 95% CI 81.1–91.4%), $P < 0.0001$. There were no significant gender differences in the mean number of times each advertisement appeared. Significant differences were noted in the distribution of advertisement appearances according to journals' premium positions. Female primary figure advertisements appeared an average of 0.82 (95% CI 0.32–1.33) times in premium positions while male primary figure advertisements appeared an average of 1.99 (95% CI 1.33–2.66) times in the same positions, $P = 0.02$ (data summarized in Table 1). The majority of the advertisements depicted the primary figure in an active role (61%), with no significant difference between advertisements with female (53%) and male (63%) primary figures ($P = 0.18$).

Similar results were found when we analysed the advertisements according to the gender of the majority of patients in each unique advertisement. Forty-one advertisements (12.4%, 95% CI 9.3–16.4%)

Table 1 Comparison of female and male patient primary figure in cardiovascular advertisements (unique advertisements and advertisement appearances)

	No. advertisements with female patient primary figure (%)	No. advertisements with male patient primary figure (%)	<i>P</i> -value
Unique advertisements	51/254 (20)	203/254 (80)	<0.0001
Advertisement appearances	249/1867 (13)	1618/1867 (87)	<0.0001
Mean no. unique advertisement appearances	4.86	7.95	0.3
Mean no. premium position appearances	0.82	1.99	0.02

were rated as female predominant, 221 (66.8%, 95% CI 61.5–71.6%) as male predominant, 56 (16.9%, 95% CI 13.3–21.3%) as neutral, and 13 (3.9%, 95% CI 2.3–6.6%) as unknown. The predominantly female advertisements appeared 174 times (7.8%, 95% CI 4.9–11.4%), while the male advertisements appeared 1634 times (73.1%, 95% CI 65.1–80.0%), the neutral advertisements 315 times (14.1%, 95% CI 9.0–20.1%) and the unknown 112 times (5.0%, 95% CI 1.8–9.2%). The differences between female and male predominance in unique advertisements and in advertisement appearances were both statistically significant ($P < 0.0001$), with more pronounced gender differences for advertisement appearances because of the predominantly male advertisements.

When we examined specific cardiovascular diseases, we noted that the primary figure was significantly more likely to be male in advertisements for hypertension and arrhythmias. No significant differences were noted for other cardiovascular conditions, although the sample sizes were limited (data summarized in Table 2).

One hundred and eighty-six (75%, 95% CI 69.3–80.0%) advertisements with a primary figure cited a reference. Of these, 148 (79.6%, 95% CI 73.2–84.7%) had citations from a refereed source. Similar proportions of female and male primary figure advertisements cited references from a refereed source ($P = 0.84$). There was no difference in the proportions of female and male predominant gender advertisements citing references from a refereed source ($P = 0.55$).

Age and race

There were significant differences in age and racial distributions between advertisements with female and male primary figures ($n = 254$) (Table 3). Similar results were found when we compared female- and male-predominant advertisements ($n = 331$). The majority of female figures were between the ages of 35 and 55 while the male figures were between the ages of 35 and 70. White people were the most frequently depicted racial group for both genders; however, blacks had higher representation in female primary figure advertisements (25%) than male primary figure advertisements (3%). Similar proportions of age and race were found when advertisement appearances were examined.

Discussion

Our study showed a marked gender asymmetry in the portrayal of patients in cardiovascular advertisements in medical journals, as previously suggested by older and smaller studies. Male patients are three to four times as likely as female patients to be portrayed as either the primary figure or the predominant gender in these pharmaceutical promotions. Male advertisements are also more likely than female advertisements to appear in journals' premium advertising positions. These gender differences appear to be more pronounced with advertisements for hypertension and arrhythmias. Our results demonstrate that

Table 2 Comparison of female and male patient primary figure according to disorder (unique cardiovascular advertisements)*

Disorder	No. advertisements with female patient primary figure (%)	No. advertisements with male patient primary figure (%)	P-value
Cardiovascular disease	51/254 (20)	203/254 (80)	<0.0001
Hypertension	33/132 (25)	99/132 (75)	0.04
Coronary artery disease	12/71 (17)	58/71 (83)	0.63
Interventional cardiology	7/42 (17)	35/42 (83)	0.55
Arrhythmias	2/33 (6)	31/33 (94)	0.03
Congestive heart failure	3/7 (43)	4/7 (57)	0.13
Hyperlipidaemia	3/20 (15)	17/20 (85)	0.55
Other	0/2 (0)	2/2 (100)	0.48

*The sum of the disease and device specific advertisements does not add up to the total number of cardiovascular advertisements as some products were promoted for the management of more than one disorder.

Table 3 Age and race of patient primary figure (unique advertisements)

<i>Characteristic</i>	<i>No. advertisements with female patient primary figure (%)</i>	<i>No. advertisements with male patient primary figure (%)</i>	<i>Total no. (%)</i>
Age (years)	51/254 (20)	203/254 (80)	254/254 (100)
<35	4/51 (8)	32/203 (16)	36/254 (14)
35–55	34/51 (66)	61/203 (30)	95/254 (37)
56–70	4/51 (8)	64/203 (31)	68/254 (27)
>70	4/51 (8)	18/203 (9)	22/254 (9)
Unknown	5/51 (10)	28/203 (14)	33/254 (13)
Race	51/254 (20)	203/254 (80)	254/254 (100)
White	34/51 (67)	170/203 (84)	204/254 (80)
Black	13/51 (25)	7/203 (3)	20/254 (8)
Hispanic	1/51 (2)	3/203 (1.5)	4/254 (1.6)
Asian	0/51 (0)	1/203 (0.5)	1/254 (0.4)
Unknown	3/51 (6)	22/203 (11)	25/254 (10)

$P < 0.0001$ for the independence of age and race categories.

Table 4 Comparison of prevalence of disorder in women, female proportion of patients with disease, female enrolment in NHLBI-funded clinical trials and female patient primary figure in unique cardiovascular advertisements

<i>Disorder</i>	<i>Prevalence in women*† (%)</i>	<i>Female proportion of patients*†† (%)</i>	<i>Female enrolment in NHLBI-funded clinical trials§ (%)</i>	<i>Advertisements with female patient primary figure (%)</i>
Cardiovascular disease	23.8	44	54	20
Hypertension	20.5	45	45	25
Coronary artery disease	5.4	44	57	17
Interventional cardiology¶	0.2#	40	NA	17
Arrhythmias	NA	NA	29	6
Congestive heart failure	1.5	39	26	43
Hyperlipidaemia	49	49	NA	15

NHLBI, National Heart, Lung, and Blood Institute.

*Non-Hispanic, white population.

†American Heart Association. 2002 Heart and Stroke Statistical Update. Dallas, Texas: American Heart Association 2001.

‡(Prevalence of disease in women)/(prevalence of disease in women + prevalence of disease in men).

§Adapted from Harris and Douglas (2000).

¶Includes stents, defibrillators, pacemakers, valves.

#Number of procedures carried out in women/total female population according to US Census Bureau (2000).

recent efforts to increase awareness of cardiovascular disease in women have not translated into more appropriate representation of women in cardiovascular advertisements in medical journals (Table 4).

The results of our study need to be considered in the context of its limitations. Although the classification of cardiovascular advertisements in our study was subjective, we made extensive efforts to maximize the accuracy and objectivity of the process. A prespecified data extraction form was used to evaluate all advertisements. Three independent coders,

including a female physician, a male physician and a female psychologist, reviewed a 10% random sample of all the advertisements. We believe that the advertisement classification is unlikely to have significantly influenced the findings of our study.

We have considered three plausible hypotheses to explain our findings. First, pharmaceutical manufacturers and advertising companies may be simply providing physicians with the images they believe to be true. Studies have repeatedly demonstrated that both physicians and patients routinely underes-

estimate the prevalence and severity of cardiovascular disease among women (Lehmann *et al.* 1996; Legato *et al.* 1997). Second, it is possible that pharmaceutical companies use predominantly male gender advertisements to maximize their product's appeal. Limited scientific evidence suggests that products endowed with a masculine image are likely to have at least moderate usage rates by women (Morris & Cundiff 1971), while products targeted to women have very low male acceptance (Alreck *et al.* 1982). Pharmaceutical companies may 'gender' cardiovascular advertisements with a masculine image with the expectation that both female and male physicians will accept the product and use it in their practice. Finally, the gender asymmetry we have observed in advertisements may be an accurate reflection of the cardiovascular medical literature. While efforts to increase female representation in cardiovascular trials are ongoing, the vast majority of available scientific evidence is based on men (Cotton 1990; Lehmann *et al.* 1996). Pharmaceutical advertisements may, in fact, be accurately reflecting current evidence-based medicine.

Our secondary analyses showed that the age and race of patients depicted in cardiovascular advertisements differed according to gender. Female patients were portrayed as being younger than male patients, in contrast with the reality that cardiovascular disease affects women later in life than men. Females were also more likely than males to be portrayed as black patients. We identified very few advertisements depicting individuals of age extremes or ethnic minorities. The majority of advertisements portrayed patients to be white people and between 35 and 70 years of age. Perhaps the most important observation is the homogeneity of medical journal cardiovascular advertisements with the typical patient portrayed as a middle-aged white man.

While the underlying reason for the gender asymmetry observed in our study is unclear, the more important uncertainty is the influence it has on the diagnosis and management of cardiovascular disease. Currently, the Food and Drug Administration (FDA) evaluates pharmaceutical promotions, but largely limits its assessments to a comparison between the advertisement and the package insert of the product. The agency neither approves nor reviews advertisements before dissemination by pharmaceutical

manufacturers (Kessler 1992). The International Committee of Medical Journal Editors (1993) has suggested that editors take full responsibility for advertising policy; however, medical journals have demonstrated little interest in ensuring the accuracy and appropriateness of advertisements (Wilkens *et al.* 1992; Hoberman 1995). In fact, advertisements represent an important source of revenue for journals, a potential conflict of interest. This gender bias in cardiovascular advertisements is a cause for concern, given the evidence that physicians use pharmaceutical advertisements as an important source of medical information (Avorn *et al.* 1982; Haayer 1982).

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