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Women's Health Issues 13 (2003) 214–221

WOMEN'S HEALTH ISSUES

PRESENTATION, DELAY, AND CONTRAINDICATION TO THROMBOLYTIC TREATMENT IN FEMALES AND MALES WITH MYOCARDIAL INFARCTION

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Received 14 April 2003; received in revised form 15 July 2003; accepted 2 September 2003

Background. This study seeks to explore gender-relevant factors of medical history, sociodemographics, symptom presentation, and delay on thrombolysis administration (or recorded contraindication) in a sample of men and women with confirmed myocardial infarction (MI).

Methods. Cross-sectional examination of self and nurse-report data collected in the coronary care unit (CCU) from 12 hospitals across south-central Ontario, Canada. A total of 482 MI patients (347 males, 135 females; 63% response rate) were recruited.

Main Findings. There was no gender difference in the report of chest pain ($\chi^2(1) = 3.78$, $p = .052$), or in prehospital delay time (median = 96.5 minutes). Thrombolysis was administered in 158 males (68.4%) and 50 females (50.0%) without reported contraindication. Females (median = 27 minutes) had a significantly longer interval between diagnostic electrocardiogram (ECG) and administration of a thrombolytic than males (median = 22, U = 3,056). No contraindication was indicated for not administering a thrombolytic (i.e., too late, risk of bleed) in approximately 40% of females. In accordance with clinical practice guidelines, thrombolysis was more often administered in participants with a shorter time interval between symptom onset and hospital arrival. For females, thrombolysis was more often administered in younger participants (Kruskal Wallis = 5.88).

Conclusions. Reducing gender, age, and socioeconomic disparities in access to thrombolysis treatment is imperative. Hospital delays with female cardiac patients may be precluding thrombolysis administration.

Keywords: Thrombolytic therapy, Delivery of health care, Sex factors, Myocardial infarction

Introduction

Current American College of Cardiology/American Heart Association guidelines recommend that thrombolytic therapy be administered to all patients regardless of age, gender, or race who have symptoms suggestive of myocardial infarction (MI) and who present to the hospital within 12 hours of symptom onset, have diagnostic changes on their 12-lead electrocardiogram (ECG) (ST-segment elevation or bundle-branch block), and have no contraindications (Ryan et al., 1996). Unfortunately, this therapy has been underused, particularly among females (Barron, Bowlby & Breen, 1998; Kaplan, Fitzpatrick, Cox, Shammas & Marder, 2002; Kudenchuk, Maynard,

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1049-3867/03 $-See front matter.
doi:10.1016/j.whi.2003.09.002

Martin, Wirkus & Weaver, 1996). Gender-relevant factors that may affect thrombolysis administration include age, medical history, symptom presentation, and delay (Fibrinolytic Therapy Trialists' Collaborative Group, 1997).

In particular, underuse of thrombolysis in females has been reported in several large studies, even after adjustment for patient age and other clinical variables (Barron et al., 1998; Bell & Nappi, 2000; Weitzman et al., 1971). A decade-long examination of thrombolysis treatment showed that 60% of eligible females received thrombolysis compared with nearly 80% of eligible males (Spencer et al., 2001). However, females do not differ significantly from males with regard to early infarct-related artery patency rates, reocclusion after thrombolytic therapy, or ventricular functional response to injury or reperfusion (Woodfield et al., 1997). While conflicting evidence exists (Cundiff, 2002), large randomized clinical trials document that thrombolysis after acute myocardial infarction reduces mortality rates among females and males (although females have higher mortality rates in both the treatment and placebo groups; ISIS-3, 1992; Weaver et al., 1996).

Objectives

The purpose of this study was to explore the constellation of gender-relevant factors in contraindication of thrombolysis administration. We will investigate differences in the administration of thrombolysis, nonadministration with legitimate contraindication recorded, and nonadministration without recorded contraindication in female and male MI patients based on both prehospital and hospital delay, and other pertinent gender differences. Based on Kaplan et al. (2002), we postulate that after taking into account recorded contraindications, delay, and symptom presentation, a bias in thrombolytic administration based on gender and age will persist.

Table 1. Sociodemographic and clinical characteristics stratified by gender

Variable	Females (n = 135)	Males (n = 347)	Test statistic
Age (mean; SD)	66.29 (12.33)	59.21 (11.61)	t (480) = −5.91[d]
Marital status (% married)	71 (53.0%)	293 (85.0%)	χ^2 = 58.08[c]
Education (% <high school)	103 (78.6%)	218 (64.9%)	χ^2 = 8.29[b]
PMH[a] myocardial infarction	41 (31.8%)	104 (31.5%)	χ^2 = .003
PMH congestive heart failure	5 (3.9%)	8 (2.4%)	χ^2 = .71
PMH diabetes mellitus	32 (26.7%)	67 (21.3%)	χ^2 = 1.44
PMH cigarette smoking	47 (37.3%)	140 (41.7%)	χ^2 = .73
Admission systolic blood pressure			χ^2 = 4.37
<100	10 (7.7%)	12 (3.6%)	
101–130	45 (34.6%)	127 (37.9%)	
131–160	53 (40.8%)	128 (38.2%)	
161–190	18 (13.8%)	57 (17.0%)	
>190	4 (3.1%)	11 (3.3%)	
Admission heart rate (beats/min)			χ^2 = 2.75
<80	68 (53.5%)	205 (61.9%)	
80–100	44 (34.6%)	96 (29.0%)	
>100	15 (11.8%)	30 (9.1%)	
Admission Killip class			χ^2 = 11.66[b]
1	88 (69.8%)	280 (84.1%)	
2, 3, or 4	38 (30.2%)	53 (15.9%)	
ST elevation			
Normal	9 (7.8%)	35 (10.8%)	
No ST elevation	37 (31.9%)	85 (26.2%)	
LBBB	9 (7.8%)	4 (1.2%)	
Inferior ST elevation	32 (27.6%)	94 (29.0%)	
Anterior ST elevation	25 (21.6%)	88 (27.2%)	
Paced	0	1 (0.3%)	
Other ST elevation	4 (3.4%)	17 (5.2%)	

Note. All variables except age, history of diabetes and smoking, marital status, and education are nurse-reported. Due to the nature of nurse-report data from 12 sites there is some missing data, and thus valid percentages are reported.

[a]Past medical history.

[b]$p < .05$.

[c]$p < .01$.

[d]$p < .001$.

Materials and Methods

Participants

Nine hundred fifty-four consecutive patients who were diagnosed with MI in twelve coronary care units (CCUs) across south-central Ontario, Canada, were approached for the study. After taking into account patient ineligibility based on illness severity (n = 107), confusion (n = 44), low English language proficiency (n = 132), unconsciousness (n = 4), and refusal, we had 482 consenting participants (response rate 63%). Of the patients approached, participants were significantly younger than those who refused or were ineligible to participate (t (948) = −10.51, $p < .001$). Significantly more males agreed to participate than females (χ^2 (1) = 19.00, $p < .001$), and more married and fewer widowed individuals agreed to participate (χ^2 (1) = 19.12, $p < .001$).

Four hundred eighty-two patients (347 males, 135 females) consented to participate in the study (see Table 1). Their ages ranged from 31 to 93 years with a mean age of 61.9 ± 12.22 years. Seventy-six percent of the participants (n = 364) were married, 31.3% had some postsecondary education (n = 146), and 45% had a family income over $50,000 CAD (i.e., approximately $32,000 USD; n = 183) annually. Family income was scored with four response categories: 68 participants (16.7%) reported an annual family income under

$25,000 CAD, 155 (38.2%) reported a family income from $25,001 to $50,000, 87 (21.4%) reported a family income from $50,001 to $75,000, and 96 (23.6%) reported over $75,000 annually (some participants declined to report their family income). With regard to disease severity, 368 (80.2%) had a Killip class score of 1. Over 80% of participants (n = 391) were recruited from a nonteaching hospital.

Measures

The self-report survey consisted of questions about sociodemographics, cardiac symptomatology, medical history, delay, and tests and treatments in checklist format. The sociodemographic data included age, gender, marital status, education, income, and living situation. Items regarding delay asked about waiting before taking action, and length of delay.

Survey data were linked with prospectively and contemporaneously collected clinical data compiled by CCU nurses. This included past medical history, admitting and confirmed diagnosis (based on ECG), presentation profile, documentation about thrombolysis (including whether it was administered, and reason for nonadministration), time of initiation of thrombolysis, and thrombolytic agent used. It also recorded time interval from symptom onset to hospital arrival, from hospital arrival to ECG, from diagnostic ECG to administration of thrombolysis, and an adjusted time interval from hospital arrival through to thrombolytic administration.

Design and procedure

This is a cross-sectional piece of a longitudinal study, linking MI patient self-reported and nurse-reported data from the CCU. Participants were recruited in the CCU by a research nurse on the second to fifth day of hospitalization. Inclusion criteria consisted of patients who were diagnosed with a confirmed MI and who were 18 years of age or older. Exclusion criteria consisted of patients who were too ill or confused to give informed consent to participate, or unable to read or speak English. Those who met study criteria and agreed to participate signed a consent form and were provided with a self-report questionnaire. Consent was also obtained to link participant's self-report questionnaire data with their nurse-recorded clinical data.

Statistical analyses

Data were cleaned and screened to evaluate statistical assumptions (Tabachnick & Fidell, 2001). Statistical analyses were performed with SPSS 11.0. A descriptive examination of the variables was performed. Gender differences in the variables of interest were tested using Pearson's χ^2 analyses and t-tests as appropriate. Mann-Whitney U and Games-Howell were used where the assumption of homogeneity of variance was violated. A Kruskal-Wallis one-way analysis of variance was used to test for significant differences in family income, age, delay in symptom onset to hospital arrival, and delay from hospital arrival to diagnostic ECG in minutes based on thrombolysis administration (i.e., thrombolysis administered, thrombolysis not administered with contraindication indicated, thrombolysis not administered with no contraindication indicated). This analysis was run separately for males and females.

Results

Gender differences in baseline characteristics of sample

Characteristics of the sample relevant to practice guidelines (Ryan et al., 1996) are presented in Table 1. Where sample sizes were large enough, Pearson's χ^2 or Student's t-test were used to test for significant differences by gender. Females participants were significantly older, were less likely to be married, and less likely to have postsecondary education than males. There were no significant gender differences in admission heart rate or systolic blood pressure; however, females were 1.27 times more likely to have a Killip class (Killip & Kimball, 1967) above one, indicating greater disease severity.

Symptom presentation

Symptoms that prompted the patient to seek hospital care are presented in Table 2. Participants reported up to 23 symptoms, with a mean of 6.13 (SD = 4.24). Chest pain was experienced by approximately 68% of male and female participants. The most frequent symptoms reported were chest pain behind the breast bone, sweating, shortness of breath, and chest pain in the left arm. Gender differences in all 25 symptoms were tested using Pearson's χ^2 with a Bonferonni adjustment (.05/25 = .002). There were no significant gender differences in any of the most frequently reported cardiac symptoms. Where gender differences did occur, symptoms experienced in the 30 days before the coronary event were more prevalent in females (e.g., pain/pressure in the right side of their back, vomiting) than males. This is likely due to the fact that women (mean = 7.44, SD = 4.62) reported significantly more symptoms than males (mean = 5.62, SD = 3.98; $t(480) = -4.33$, $p < .001$).

Stages of delay

Prehospital delay. In terms of self-reports, once symptoms began 105 (77.8%) females and 293 (84.4%) males delayed before taking action, but this gender difference in delay did not reach statistical significance (χ^2 (1) = 3.00, p = .08). Delay was also recorded in the CCU by nurses (see Table 3). The nurse-recorded time

Table 2. Self-reported cardiac symptom presentation by gender

Symptom	Females (n = 135)	Males (n = 347)	χ^2 (1)
Chest pain behind breast bone	87 (65.4%)	238 (69.0%)	0.56
Sweating	75 (56.4%)	169 (49.0%)	2.11
Shortness of breath	67 (50.4%)	139 (40.3%)	3.98
Chest pain into left arm	67 (50.4%)	150 (43.5%)	1.84
Weakness	58 (43.6%)	116 (33.6%)	4.14
Nausea	57 (42.9%)	100 (29.0%)	8.37
Anxiety	48 (36.1%)	103 (29.9%)	1.73
Chest pain into neck	47 (35.3%)	71 (20.6%)	11.24[a]
Fatigue	46 (34.6%)	102 (29.6%)	1.13
Funny feeling in chest	43 (32.3%)	88 (25.5%)	2.25
Dizziness	40 (30.1%)	69 (20.0%)	5.54
Pain in left side of back	37 (27.8%)	53 (15.4%)	9.75[a]
Chest pain into jaw	37 (27.8%)	47 (13.6%)	13.36[b]
Faint feeling	37 (27.8%)	53 (15.4%)	9.75[a]
Feeling ill	36 (27.1%)	79 (22.9%)	0.91
Vomiting	34 (25.6%)	40 (11.6%)	14.32[b]
Indigestion	32 (24.1%)	66 (19.1%)	1.43
Light-headedness	31 (23.3%)	44 (12.8%)	8.08
Numbness/tingling	31 (23.3%)	58 (16.8%)	2.67
Pain in right side of back	30 (22.6%)	37 (10.7%)	11.15[a]
Losing energy	20 (15.0%)	55 (15.9%)	0.06
Pain in abdomen	13 (9.8%)	18 (5.2%)	3.29
Pain in left arm, no chest pain	14 (10.5%)	25 (7.2%)	1.38
Pain in jaw, no chest pain	10 (7.5%)	10 (2.9%)	5.11
Fainting	8 (6.0%)	19 (5.5%)	0.05

[a] $p < .002$.
[b] $p < .001$.

interval between symptom onset and hospital arrival ranged from 0 to 899.0 minutes, with a median of 96.5 minutes (interquartile range = 135.75), or approximately 1.5 hours. There was no gender difference in nurse-reported delay time from onset of symptoms to hospital arrival (p = .52).

Table 3. Nurse-recorded median number of minutes delay in cardiac care by gender

Variable	Females (n = 135)	Males (n = 347)	Mann-Whitney U[a]
Symptom onset to arrival	110.0	92.5	7450.5
Arrival to first ECG	10.5	7.0	9365.5
Diagnostic ECG to thrombolysis	27.0	22.0	3056.0[c]
Delay to order thrombolysis	12.0	9.0	3016.5
Arrival to thrombolysis	43.5	37.5	3111.5
Adjusted arrival to thrombolysis[b]	38.5	30.0	2711.0[d]

[a] Mann-Whitney U used to test for significant gender differences due to the heterogeneity of variance in time delay.
[b] The nurse-recorded adjusted arrival to thrombolysis figures provide an accurate method to assess time-to-treatment for those patients whose first ECG may not have been the diagnostic ECG.
[c] $p < .05$.
[d] $p < .01$.

Table 4. Frequency of nurse-reported thrombolysis administration and contraindication by gender

Reason	Female (%) (n = 135)	Male (%) (n = 347)
Thrombolysis administered	50 (37.9%)	158 (46.5%)
Thrombolysis not administered		
ECG not diagnostic	20 (15.2%)	62 (18.2%)
Too late	8 (6.1%)	43 (12.6%)
Risk intracranial bleed	1 (0.8%)	3 (0.9%)
Risk bleed in other site	2 (1.5%)	0 (0%)
Risk—other	1 (0.8%)	1 (0.3%)
No reason given	50 (37.9%)	73 (21.5%)

Note: There were no data available for three females and seven males.

Hospital delay. The nurse-recorded time from hospital arrival to the first ECG ranged from 0 to 270 minutes, with a median of 8 minutes (interquartile range = 9.0; trend toward longer delay among women, p = .06). The time from the diagnostic ECG to the administration of the thrombolytic drug ranged from 0 to 254 minutes, with median of 24 minutes (interquartile range = 22.25). There was a significantly longer delay for female patients from diagnostic ECG to thrombolysis administration (p = .034). The time required to order the thrombolytic ranged from 0 to 54 minutes, with a median of 10 minutes (interquartile range = 13.25).

The overall time from hospital arrival to thrombolytic administration ranged from 0 to 960 minutes, with a median of 38.5 minutes (interquartile range = 42.5). The nurse-recorded adjusted arrival to thrombolysis figures provide an accurate method to assess time-to-treatment for those patients whose first ECG may not have been the diagnostic ECG. The adjusted arrival to drug time ranged from a minimum of 0 minutes to a maximum of 436 minutes. The median number of minutes was 33 (interquartile range = 26.0), with women waiting significantly longer than men (p = .005).

Thrombolysis

Two hundred eight participants (44.1%) were thrombolyzed. Patient contraindications to thrombolysis are presented in Table 4. Of the patients for whom there were no contraindications to thrombolysis (i.e., diagnostic ECG, arrived without delay, no risk of bleeding; n = 331), thrombolytic was given on admission to 208 patients (62.8%), but not to 123 patients (37.2%). There was a significant gender difference in administration of thrombolysis among those patients with an MI who were eligible for such treatment (χ^2 (1) = 10.12, p = .001). Fifty females (50.0%) and 158 males (68.4%)

Table 5. Median age, family income, and prehospital and hospital delay in minutes based on gender, and nurse recording regarding thrombolysis administration

Independent Variable	Tlysis Administered	Tlysis Not Administered No Contraindication Recorded	Tlysis Not Administered Contraindication Recorded
		Males	
Age	55.5	60.0	60.5
Family income[a,b]	3.0[c]	3.0	2.0[c]
Onset—arrival time[b]	81.0[c]	176.0	245.5[c]
Arrival—ECG time[b]	7.0	13.0	18.5
		Females	
Age[b]	65.0[c]	69.5[c]	66.0[c]
Family income	2.0	1.0	1.0
Onset—arrival time[b]	105.0[c]	89.5	245.0[c]
Arrival—ECG time[b]	11.0[d]	18.0	13.0[d]

[a]Family income is scored from 1 to 4 with higher scores denoting higher annual family income.
[b]Denotes significant difference based on Kruskal-Wallis one-way analysis of variance.
[c]Denotes significant difference in post-hoc LSD or Games-Howell tests.
[d]Games-Howell, $p = .083$.

received this treatment. There was also a significant gender difference in reasons that thrombolysis was not administered, χ^2 (6) = 40.98, $p < .001$. Females were less likely to receive the drug, and at the same time less likely to have a recorded explanation for contraindication than males.

Two Kruskal-Wallis one-way ANOVAs were performed examining thrombolysis: whether it was administered, not administered with recorded contraindication, or not administered without recorded contraindication (see Table 5). One was performed using the male sample, the other with the female sample. Independent variables were fourfold: age, family income, symptom onset to arrival time, and time from hospital arrival to diagnostic ECG. Tests of homogeneity of variance revealed that age (Levene's statistic = .82, $p = .44$) and family income (Levene's statistic = .68, $p = .51$) met this assumption; however, onset to arrival time (Levene's statistic = 31.96, $p < .001$) and hospital arrival to ECG time (Levene's statistic = 3.39, $p = .04$) did not. Therefore, where Kruskal-Wallis was significant, post-hoc LSD tests were used where assumptions were met and Games-Howell was used where assumptions were violated.

Among males, there was a significant difference in thrombolysis administration based on family income (χ^2 (2) = 7.30, $p = .03$), onset to arrival time (χ^2 (2) = 17.72, $p < .001$), and arrival to ECG time (χ^2 (2) = 39.90, $p < .001$). Post-hoc LSD tests revealed that male MI patients who received thrombolysis had significantly higher family income than those who did not receive thrombolysis due to a legitimate contraindication ($p = .006$), and Games-Howell revealed that males who received thrombolysis had significantly shorter delay from onset to arrival than patients with a legitimate contraindication ($p < .001$). For females, there was a significant difference in thrombolysis administration based on age (χ^2 (2) = 5.88, $p = .05$), symptom onset to hospital arrival time (χ^2 (2) = 9.58, $p = .01$), and arrival to ECG time (χ^2 (2) = 7.85, $p = .02$). Post-hoc LSD tests revealed that female MI patients who received thrombolysis were significantly younger than those who did not receive thrombolysis due to a legitimate contraindication ($p = .02$), and younger than those for whom there was no contraindication provided for nonadministration ($p = .04$). Based on Games-Howell, females who received thrombolysis had significant shorter delay from onset to arrival than patients with a legitimate contraindication ($p = .01$).

Discussion

This study explored gender differences relevant to the administration of thrombolysis. The baseline characteristics of the sample were similar to those presented in the literature. There were no significant gender differences in heart rate or systolic blood pressure on admission, but females were older, less educated, and more likely to have a higher Killip class than males. In regard to symptom presentation, there were no gender differences in typical cardiac symptoms including chest pain. Contrary to the literature, there was no significant gender difference in prehospital delay assessed via self-report or nurse-report, but there was a significantly longer hospital delay for female patients from the diagnostic ECG to thrombolysis. Upon arrival to the hospital, 68% of eligible males and 50% of eligible females received thrombolysis. For approximately 40% of females, there was no contraindication recorded regarding why they did not receive such treatment.

Symptom presentation

The pervasive stereotype of ischemic heart disease (IHD) as a predominantly male disorder that presents with chest pain and incapacitating symptoms effectively discounts the experience in females. Females are more likely to experience symptoms that do not fit the established patterns for MIs (Miller, 2000; Milner, Funk, Richards, Wilmes, Vaccarino & Krumholz, 1999). Despite the fact that chest pain is the most common presentation, there is still a large contingent of females who present with symptoms that can be confused or misinterpreted. Indigestion, nausea, vomiting, shortness of breath, fatigue, and edema are not uncommon in females. If any of these occur without chest pain they can easily be interpreted as a cold, flu, or other common ailments, and appropriate investigations not undertaken.

In this sample, approximately 68% of participants reported chest pain, and there was no significant gender difference in prevalence of this symptom. However, females reported a significantly greater number of nonchest pain symptoms such as vomiting, feeling faint, pain radiating into the neck, and radiating into the left side of the back, which is consistent with other studies (Milner et al., 1999). The reasons for gender differences in cardiac symptom prevalence are unknown, but polysymptomatic presentation may obscure the underlying cardiac etiology for patients and physicians.

Females may delay help-seeking because their cardiac symptoms do not match expected male symptoms such as central chest pain, radiating arm or shoulder pain, and collapse (Finnegan et al., 2000; van Tiel, van Vliet & Moerman, 1998). Vague and less typical symptoms may be experienced by females, and this incongruence can lead to delay in seeking treatment, diagnosis, and underuse of effective therapies (Horne, James, Petrie, Weinman & Vincent, 2000; Miller, 2000).

Delay

Thrombolysis is more effective the earlier it is administered. Prehospital delay time is defined as the amount of time between the first awareness of symptoms and arrival at hospital (Dracup, Moser, Eisenberg, Meischke, Alonzo & Braslow, 1995). Given the importance of reperfusion therapy for MI, the interval from the onset of symptoms to the initiation of treatment is also critical. The hospital action phase, more popularly known as "door-to-needle time," encompasses the interval from the patient's arrival at the hospital to receiving definitive care, such as thrombolysis.

We found no gender differences in prehospital delay. This may be related to the typical symptomatology reported by both males and females, which lead them to identify and label their symptoms as cardiac in nature. The median prehospital delay time varies in the literature from 2 to 6.5 hours (Dracup et al., 1995). The median prehospital delay in this sample was over 1.5 hours, which is comparable to the Western Washington thrombolytic therapy trials (Maynard, Althouse, Olsufka, Ritchie, Davis & Kennedy, 1989), and the 2.2 hours median delay reported by Horne et al. (2000). The median adjusted door-to-needle time was 33 minutes, significantly shorter for males than females in bivariate analyses. The literature reports a hospital action phase delay time of 60 to 90 minutes (Barakat, Wilkinson, Suliman, Ranjadayalan & Timmis, 2000), which is consistent with our unadjusted door-to-needle time. These median delay times are well under the 12 hours (e.g., 720 minutes) recommended to ensure the efficacy to thrombolysis.

Thrombolytic treatment

Thrombolysis was administered in 62.8% of eligible participants. For over 30% of participants who appeared eligible for thrombolysis, however, there was no contraindication recorded. The analyses of variance showed that the delay from symptom onset to arrival at the hospital, and from arrival at the hospital to ECG was significantly related to administration of thrombolysis in both women and men, which is consistent with clinical practice guidelines. However, some troubling findings emerged. Among women, older age was significantly related to a lack of recorded contraindication for thrombolytic administration. Clinical practice guidelines indicate the use of thrombolysis regardless of age (Ryan et al., 1996). However, females are more often older than males at the time of an MI (Hochman et al., 1997; Malacrida et al., 1998; Woodfield et al., 1997), and the literature suggests that patients who are older are less likely to receive thrombolytic therapy (Spencer et al., 2001). Promotion activities to increase awareness of the benefits of thrombolysis in older female cardiac patients should be pursued.

Among men, there was a significant difference in thrombolytic administration based on family income. Clearly, despite the universal healthcare system (i.e., single-payer) in which this study was conducted, unexplained inequalities in health care remain. These findings could be due to a third variable, considering that low-income patients are often in poorer health than high-income patients. In this sample, potential alternative explanations for underuse of thrombolysis could be related to comorbidity, subtle or overt classism, ageism, or sexism, level of literacy, knowledge, or disease severity, but cannot be explained by out-of-pocket costs, differences in health insurance coverage, symptom presentation, or delay in reaching medical care. Other research in the region demonstrates that patients of low socioeconomic status have less access to angiography and revascularization (Alter, Naylor, Austin & Tu, 1999), supporting our findings.

Study limitations

Caution is warranted when interpreting these results considering our 63% response rate, that there were some significant differences in our sample participants when compared to nonparticipants, and the significant gender differences among participants. Moreover, due to the nature of collecting nurse-report data across 12 sites, some medical data were missing. This study was conducted in an English-speaking Canadian population, thus these results may not be generalizable to other populations or health care systems. Finally, where there was no documented contraindication for thrombolytic administration, this could merely represent a nursing error or records error. Future research is warranted to investigate the relationship between patient characteristics and divergence from clinical practice guidelines, which may include interviewing emergency room personnel and treating physicians.

Conclusion

Contrary to other reports, there were no significant gender differences in prehospital delay among patients hospitalized for an MI, but longer hospital delays for women patients were evident. Nor were there significant gender differences in presentation with chest pain, although women presented with more symptoms overall than men. Analysis of nurse-reports failed to reveal a recorded contraindication for thrombolysis more frequently in females compared to males. Overall, women were less likely to receive a thrombolytic than men, and this is clearly multifactorial. Our results show that this could be explained by the longer delay from diagnostic ECG to thrombolytic administration, or older age. Clinical practice guidelines promote thrombolytic administration regardless of age, and the gender difference in hospital delay is disconcerting. In summary, the gap in ischemic coronary care appears to be multifactorial, consisting in gender, age, and socioeconomic issues, differences in risk factors (i.e., severity, comorbidity), as well as hospital delay. Prehospital delay and presentation of chest pain may not play as large a role in gender differences as previously suspected.

Acknowledgments

We gratefully acknowledge Eli-Lilly Canada for funding the UHN-Eli Lilly Women's Health Fellowship which supported Dr. Grace, the Heart and Stroke Foundation of Ontario for a research grant to investigate gender differences in CCU patients to Drs. Stewart and Abbey, and the Samuel Lunenfeld Foundation which funded pilot work by Drs. Stewart and Abbey. We also acknowledge Linda Green and the CCU staff nurses for their diligence in recruitment and data collection.

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