Beta-blocker medication usage in older women after myocardial infarction

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Abstract:

Purpose: The purpose of this study was to assess demographic characteristics of women prescribed beta-blocker (β-blocker) medication and compare to those not using β-blocker medication, and to determine if there are differences in depression and fatigue among women who used β-blockers compared to nonusers 6–12 months after myocardial infarction (MI).

Data sources: This was a descriptive cross-sectional study of 84 women (61 using β-blockers and 23 not using β-blockers) aged 65 and older who were 6–12 months post-MI. Women had their height and weight measured and completed a Demographic Health Form, the Geriatric Depression Scale, and the Revised Piper Fatigue Scale (RPFS).

Conclusions: While most of the women were taking b-blockers after MI (74%), significantly fewer Black women were taking b-blockers ($\chi^2 = 5.086$, $p = 0.032$). Most of the b-blocker users were overweight or obese. There were no significant differences in age, $t(82) = 0.7$, $p = 0.486$; body mass index, $t(82) = 0.76$, $p = 0.445$; income, $\chi^2(\text{df} = 2) = 3.219$, $p = 0.075$; mean depression, $t(82) = 1.648$, $p = 0.103$; or fatigue scores, $t(82) = 0.993$, $p = 0.324$, between β-blocker users and nonusers. More of those not taking β-blockers reported fatigue with significantly higher fatigue in the affective meaning dimension of the RPFS, $t(82) = 2.272$, $p = 0.03$.

Implications for practice: β-Blocker medication continues to be underutilized in older women. Because no difference was noted in fatigue and depression in the two groups, these may mean that these side effects are not barriers in prescribing this medication post-MI. Nurse practitioners are in pivotal positions to monitor the ongoing physiological and psychological sequelae post-MI and implement interventions to improve their outcomes.

Keywords: Older women; myocardial infarction; beta-blocker.

Article:

Introduction

Myocardial infarction (MI) primarily occurs in older adults. In fact, the approximate average age of the first occurrence of MI in men is 66 years and 70 years in women. In addition to women being older with their first MI, they also do not medically fare as well as men. While men usually have MIs earlier in life, 35% of women experience another MI compared to 18% of men, and 38% of women die within the first year as compared with 25% of men (American Heart Association, 2005). Therefore, measures to prevent recurrent MIs are important, especially for older women. One pharmacological intervention to decrease recurrent MIs is beta-blockers (β-blockers) (American College of Cardiology, 2004; Park, Forman, & Wei, 1995).

β-Blocker therapy after MI reduces mortality (Barron et al., 1998; Chen et al., 1999, 2000) and reverses cardio-vascular remodeling (Remme, 2003). The "most common cause of heart failure and remodeling is myocardial infarction" (Remme, p. 350). Remodeling is a process of structural changes occurring in at least one cardiac chamber, thus changing the shape of the heart from ellipsoid to global. This process results in an increase in end-diastolic and systolic volume leading to cardiac hypertrophy. One mediator of this process includes

neurohormonal activation via the sympathetic nervous system. Blocking the sympathetic system post-MI would inhibit or reverse remodeling (Remme; Sharpe, 2004) and thus assist in maintaining cardiac function. Long-term β-blocker use after MI is a class I treatment recommendation by the American College of Cardiology and the American Heart Association (American College of Cardiology, 1999). However, despite the benefits of β-blocker medications, numerous studies indicate they have been underprescribed to patients after MI (Barron et al.; Chen et al.,1999; Vittinghoff et al., 2003) especially in older adults (Soumerai et al.,1997; Wei, Flynn, Murray, & MacDonald, 2004; Woon & Lim, 2003). One possible reason for the underuse of β-blockers in older adults may be the potential for side effects (Head, Kendall, Ferner, & Eagles, 1996).

Changes in the pharmacokinetic profile with aging may play a role in the side effects of β-blockers after MI in older adults. An important pharmacokinetic issue for older adults taking β-blockers after MI is the elimination pathway. Age-related changes, such as decreases in hepatic and renal blood flow, may directly affect the amount of drug availability and, therefore, potentially increase adverse effects. For example, a study comparing atenolol in young and older men found differences in pharmacokinetics. Older men had greater reduction in heart rate at all concentrations. These differences were attributed to age-related changes in renal function (Sowinski et al., 1995). Therefore, older adults may exhibit more adverse effects of β-blocker medication, such as depression and fatigue.

Thus, the purposes of this study were to (a) assess demographic characteristics of women prescribed β-blocker medication and compare to those not using β-blockers and (b) determine if there are differences in depression and fatigue among women who used β-blockers compared to nonusers 6–12 months post-MI. Specifically, the study addressed the following research questions:

1. What demographic characteristics best describe women who are taking β-blockers after MI?

2. Are there differences in demographic characteristics (age, body mass index [BMI], income, race) of women who are taking β-blockers after MI and those not taking β-blockers?

3. Are there differences in depression and/or fatigue between the women who use β-blockers compared to nonusers?

Review of literature

β-Blocker usage

Despite evidence to support the use of β-blockers after an MI, research indicates that β-blockers are underused in older adults (Soumerai et al., 1997; Wang & Stafford, 1998). However, a recent study noted changes in β-blocker usage after MI (Olomu et al., 2004). The researchers examined 408 patients post-MI who had no contraindications to β-blocker use comparing those discharged between 1994 and 1995 to those discharged in 1997. While the proportion of those discharged on a β-blocker medication increased from 34% to 62%, the use of β-blockers continues to be low. In examining the characteristics of patients discharged from the hospital and β -blocker use, those receiving β -blocker therapy were adults 55 years of age and younger (odds ratio [OR] 2.07; 95% confidence interval [CI], 1.32–3.23) or had hypertension (OR, 1.67; 95% CI, 1.07–2.60). Further, only 12.5% of those with a history of prior MI were taking β -blockers on arrival to the hospital. These results may be related to under-prescription of β -blockers post-MI in older adults or adherence. Butler et al. (2002) noted that persons not discharged from a hospital on β -blocker therapy who were 75 years or older were significantly less likely to begin β -blocker therapy later, and those discharged on β -blocker therapy decreased usage over time. Further studies are needed to identify characteristics of those using β-blockers after MI, especially in older adults.

Side effects: depression and fatigue

The prevalence of depression in women is twice that in men (Abbey & Stewart, 2000). Recognition of depressive symptoms, especially after MI, is important because those identified as having mild to major depression report a lower adherence to risk reduction behaviors such as regular exercise (Mayou et al., 2000;

Ziegelstein et al., 2000), and they have higher mortality (Bush et al.; Schulz et al., 2000). In fact, Bush et al. reported that the presence of even a few depressive symptoms increases mortality risk after an MI. Levels of depression may vary after an MI. However, findings from a synthesis of emotional outcomes in women with coronary heart disease (King, 2001) noted that depression scores stabilize 6 months after an acute event. Therefore, measuring depression 6–12 months after MI may capture depression associated with β -blocker usage, not depression associated with the MI.

Fatigue is another side effect associated with β -blocker usage. Although depression and fatigue are related (Crane, 2005; Kopp, Falger, Appels, & Szedmak, 2003; Mayou et al., 2000; Milani & Lavie, 1998; Sullivan, LaCroix, Russo, & Walker, 2001), research indicates that they are distinct (Irvine et al., 1999; Kopp et al.; Sullivan et al.). Results of a recent meta-analysis conducted to examine the side effects of depression, fatigue, and/or sexual dysfunction in 15 randomized clinical trials of β -blockers used post-MI, for hypertension, and congestive heart failure noted no risk for depressive symptoms and small risks of fatigue (Ko et al., 2002). Of the 42 trials meeting the inclusion criteria for the meta-analysis (minimum of 100 participants with at least a 6-month follow-up), only 15 reported information on the side effects of either depression, fatigue, and/or sexual dysfunction. Only six of these trials examined the side effects of β -blockers after MI, and these trials were published from 1981 to 1985. However, these studies had limited representation of older women. For example, the mean age of the participants in these six trials reporting the symptoms of fatigue (n = 4) and/or depression (n = 3) after MI ranged from 55 to 61, and the samples included 21% or fewer women. These findings are consistent with a recent study that examined representation of older adults and women in randomized trials of acute coronary syndromes (Lee, Alexander, Ham-mill, Pasquali, & Peterson, 2001). While the proportion of older adults and women included in the trials increased from 1966–1990 to 1991–2000, both older adults and women are underrepresented in relation to the proportion of those having an MI. Thus, we know little about the side effects of fatigue or depression in adults 65 years of age and older taking β -blockers after MI, especially older women.

Hypotheses

Older women who use β -blockers after an MI differ from women who are not using β -blockers after MI on age, income, BMI, and race. Women who use β -blockers will report different depression and fatigue scores than women who do not use β -blockers after MI.

Research methods

This study was part of a larger cross-sectional descriptive study (Crane, 2005) that examined fatigue and physical activity in women 65 years of age and older 6–12 months after MI.

Sample

A convenience sample of women 65 years and older was recruited to participate in the study. Inclusion criteria included being discharged from one of three hospitals located in an urban area of the southern United States with a diagnosis of MI according to International Classification of Diseases (410.0–410.9) within the last 6–12 months. Women were excluded if they self-reported a diagnosis of a previous memory deficit, taking antidepressant medication, they could not read or speak English, or verbally stated they did not have an MI. A priori power analysis indicated a sample of 84 older women would provide an 80% power to detect an R^2 of 0.15 with seven covariates.

Measurement

Demographic and health information were collected using an investigator-developed tool. This descriptive tool was developed in consultation with a cardiovascular researcher (McSweeney, 1998), from the literature, and from the American Heart Association guidelines (American Heart Association, 1997). Age was measured as the self-reported age on their last birthday. After completing the demographic and health information, each woman's weight and height were measured using standardized equipment (Tanita electronic scale and Seca Road Rod), and BMI was calculated (kg /m^2). Direct inspection of the patient's medication, noting the drug

class and dose on the medication bottle, and verifying with each participant that they took this medication as prescribed provided the information to measure 0-blocker medication.

Subjective fatigue was measured using the Revised Piper Fatigue Scale (RPFS). This instrument consists of 22 items that measure four dimensions of fatigue: behavioral/ severity, affective meaning, sensory, and cognitive/mood (Piper et al., 1998). Each item is measured using a Likert Scale with scores ranging from 0 (no fatigue or lowest level of a word anchor) to 10 (highest level of fatigue or of the word anchor). For example, one question is "To what degree is the fatigue you are feeling now causing you distress?" The anchors are "no distress" and "a great deal of distress." The total fatigue score was calculated by adding the number obtained from each item. Scores could range from 0 to 220. The behavioral/severity subscale has six items and examines the intensity or severity of fatigue, the distress associated with fatigue, and how fatigue interferes with life. The affective meaning subscale (five items) focuses on the feelings associated with fatigue such as agreeable or disagreeable and normal or abnormal. The five items comprising the sensory subscale include how the fatigue makes the participant feel. For example, anchors in this dimension include strong/weak and awake/sleepy. The last subscale, cognitive/mood, has six items including ability to concentrate and ability to remember. Piper et al. (1998) report the subscales having a Chronbach's alpha of greater than 0.92 and a standardized alpha for the total scale at 0.97. Another study of older adults noted test– retest reliability of .0904 ($p < .0001$) for the total score (Liao & Ferrell, 2000). Additionally, this instrument has been used with older adult populations (Liao & Ferrell; Varvaro, Sereika, Zullo, & Robertson, 1996).

Depression was measured using the 30-item Geriatric Depression Scale (GDS). This dichotomous scale (yes/no) was designed for elders and has been validated in previous studies. A score of greater than or equal to 11 indicates possible depression (Burke, Roccaforte, Wengel, Conley, & Potter, 1995; Sheikh & Yesavage, 1986). A cut off score of 11 has 84% sensitivity and 95% specificity for depression (Brink et al., 1982). A study of the 30-item GDS in those with Parkinson's disease noted a Cronbach's alpha score of 0.92 and a correlation coefficient of 0.91 (Ertan, Ertan, Kiziltan, & Uygucgil, 2005). This instrument has also been used in studies of women post-MI (Crane & McSweeney, 2003) and women and men after coronary artery bypass surgery (Mallik et al., 2005).

Procedure

After receiving approval from the appropriate institutional review boards, each woman discharged with a diagnosis of MI who indicated an interest in participating in the study was contacted by telephone to further explain the study, answer questions, and screen for eligibility. All women who met the eligibility criteria and agreed to participate were included in the study and completed the data collection. After the women completed the informed consent, the principal investigator or research assistant helped the women complete the data collection instruments. The data collection procedure took 45–90 min of time.

Statistical analysis

Descriptive statistics, such as proportions, means, and standard deviations, were used to describe the sample and proportions were used to answer research question 1. A chi-square statistic was used to compare categorical data (such as income categories and race), and a Student's Independent *t*-test was used to compare groups on continuous measures (age, BMI, depression scores, and fatigue scores). To answer the second research question, both the chi-square and the *t*-test were used. Only the Student's *t*-test, two tailed, was used to answer research question 3. All data were analyzed using SPSS 13.0 (SPSS Inc., Chicago, IL) using an alpha of less than 0.05.

To satisfy assumptions for the use of a t-test, continuous variables were examined for normal distribution. The GDS score was positively skewed and was transformed using the square root. Levine's test for equality of variances was examined for significance. All were nonsignificant; therefore, equal variances were assumed.

Results

Out of 157 women who indicated interests, 42 did not meet eligibility, 13 refused with no reason, and the rest refused related to various issues such as ―notfeeling well" or ―too busy." Eighty-four women participated in the study.

Research question 1

Most of the women were taking β -blockers (n = 61). These women were mostly White (n = 53, 87%), not married (n = 33, 54%), between the ages of 66 and 74 (n = 33, 54%), had their first MI (n = 50, 77%), and stated they had a history of hypertension (n = 50, 77%). According to the National Institutes of Health guidelines (National Heart, Lung and Blood Institute, 1998), the majority were overweight (n = 24, 40%) and obese (n = 21, 34%). The majority of women (n = 32, 53%) reported average combined yearly household income as less than $20,000 (see Table 1). Most of the women were taking metoprolol (generic n = 21, Toprol n = 19), followed by atenolol (n =13), carvedilol (n = 7), propranolol (n =1), and sotalol (n = 1) with the majority of women taking lower dosages of β-blockers than recommended (see Table 2).

Table 1 Demographics of older women and β-blocker use and nonuse (N = 84)

Demographics	β-Blocker users n = 61 (%)	β-Blocker nonusers n = 23 (%)	p value
Age (in years)	74.6[a] (SD = 5.55)	75.65[a] (SD = 6.47)	0.486[b]
Ethnicity			0.032[c]
White/Hispanic	53 (87)	15 (65)	
Black	8 (13)	8 (35)	
Marital status			
Married	28 (46)	7 (30)	
Divorced/separated	6 (10)	2 (9)	
Widowed	25 (41)	13 (57)	
Never married	2 (3)	1 (4)	
Education			
High school or less	42 (69)	15 (65)	
Some technical/college	16 (26)	5 (22)	
Bachelor's degree	1 (2)	1 (4)	
Graduate degree	2 (3)	2 (9)	
Income			0.075[c]
0$–$19,999	32 (53)	17 (74)	
>$19,999	28 (46)	5 (22)	
Did not know	1 (1)	1 (4)	
Body mass index	28.4[a] (SD = 6.19)	29.6[a] (SD = 7.06)	0.445[b]
First myocardial infarction occurrence			
Yes	47 (77)	16 (70)	
No	14 (23)	7 (30)	
History of hypertension			
Yes	47 (77)	14 (61)	
No	14 (23)	9 (39)	
History of diabetes			
Yes	18 (30)	8 (35)	
No	43 (70)	15 (65)	

[a]Denotes mean value.
[b]Independent t-test.
[c]Chi-square test.

Table 2 Types of β-blockers by dosage

Medication	Dosage (mg in 24 h)	n = 61	Dosage level (L = low, M = medium, H = high)
Metoprolol	25	1	L
	50	15	L
	75	1	M
	100	4	M
Atenolol	12.5	1	L
	25	4	L
	50	8	M
Toprol[a]	12.5	1	L
	25	7	L
	50	7	L
	100	3	M
	150	1	M
Sotalol[a]	80	1	L
Propranolol	40	1	L
Carvedilol	6.25	1	L
	6.5	1	L
	12.5	2	L
	25	2	M
	50	1	H

[a]One subject on two β-blockers (Toprol and sotalol).

Research question 2

There were no significant differences in age, $t(82) = 0.7$, $p = 0.486$, BMI, $t(82) = 0.76$, $p = 0.445$; or income, $\chi^2(df = 2) = 3.219$, $p = 0$ .75, in older women taking β-blockers or not taking β -blockers after MI. However, 47.5% of those taking β -blockers had incomes greater than or equal to $20,000 compared to 26% of those not taking β -blockers. Significantly fewer Black women were taking β -blockers ($\chi^2 = 5.086$, $p = 0.032$) compared to White women.

Research question 3

Depression

The scores on the GDS ranged from 1 to 15 for those not on β -blockers and 0 to 24 for those taking β -blockers after MI. Twenty-six percent of women not taking β -blockers had scores on the GDS greater than or equal to 11 compared to 21 % of women taking β -blockers. Therefore, most (74%) of the nonusers and the users (79%) were not depressed. Women not taking β -blockers had higher mean depression scores (7.35, SD = 4.27) than women taking β -blockers (5.90, SD = 5.24). However, this difference was not statistically significant, $t(82) = 1.648$, $p = 0.103$.

Fatigue

Forty women (66%) taking β -blocker medication and 16 women (70%) not taking β -blocker medication reported fatigue that was different from the fatigue experienced prior to their MI. The RPFS total scores for women not using β-blockers ranged from 0 to 190 (M= 89.73, SD = 65.838) and 0 to 182 (M = 74.08, SD = 63.9) for those taking β -blockers. While those not taking a β -blocker had higher mean fatigue scores on 18 of the 22 items, there was no significant difference in the mean scores between the two groups, $t(82) = 0.993$, $p = 0.324$. When examining fatigue by each dimension (see Table 3), those not taking a β -blocker reported significantly higher fatigue in the affective meaning dimension of the RPFS, $t(82) = 2.272$, $p = 0.03$.

Discussion

For over 20 years, clinical evidence has pointed to the substantial benefits of β -blockers in decreasing mortality after an MI (Barron et al., 1998; Chen et al., 1999, 2000). Despite evidence-based clinical practice guidelines recommending β -blockers indefinitely for all MI survivors except for those with absolute contraindications, β -blockers are still underused. While this study found the majority of women were taking β -blocker medications after MI, this study supports other studies noting the underuse of β -blockers in older adults (Soumerai et al., 1997; Wei et al., 2004; Woon & Lim, 2003).

The dosages of β -blockers were frequently lower than those recommended. Anderson, Jones, and Evanko (2003) also noted that often older adults were not prescribed the recommended dosages. Because this study did not examine β -blocker usage prior to the time of data collection, it is unclear if (a) the women had the dosage titrated for patient tolerance, such as heart rate or blood pressure, (b) the dose was titrated for hepatic or renal changes associated with aging, or (c) if the women not taking a β -blocker stopped the medication related to unpleasant side effects of the medication, such as depression and fatigue. Further studies are needed to examine optimization of β -blocker dosage in older women after MI over time.

Although depression is prevalent in older heart patients and those post-MI, coronary artery bypass or angioplasty (Milani & Lavie, 1998), an integrative review found that emotional distress, including depression and anxiety, decreased over time but stabilized by 6 months (King, 2001). Therefore, it was surprising to find that almost half (47%) of the sample had scores of 11 or higher on the GDS.

Table 3 Women's fatigue score by dimension on the Revised Piper Fatigue Scale (n = 56)

Dimension	β-Blocker users mean (SD)	β-Blocker nonusers mean (SD)	Significance level
Behavioral/severity	24.93 (SD = 15.65)	30.56 (SD = 11.72)	$F = 1.688$
Affective	25.39 (SD = 10.99)	32.31 (SD = 8.89)	$F = 4.30$[a]
Sensory	30.45 (SD = 10.872)	34.38 (SD = 5.97)	$F = 1.848$
Cognitive/mood	31.7 (SD = 14.09)	31.75 (SD = 9.69)	$F = .000$

[a]Significant $p < 0.05$.

This proportion is higher than the 11 % reported in those with heart failure (Turvey, Schultz, Arndt, Wallace, & Herzog, 2002). Women not taking β -blocker medication had higher mean depression scores and more women scored 11 or higher: the cut off score screening for depression. Because this study did not include any women taking antidepressants, these results are especially concerning because depression is associated with increased 1-year cardiac mortality (Herrmann, Brand-Driehorst, Buss, & Ruger, 2000; Kaufmann et al., 1999).

The proportion of older women reporting fatigue in this study is greater than the 27.5% of 153 women ranking fatigue as their top concern and less than the 80.4% reporting fatigue as one of their top concerns (Stewart, Abbey, Meana, & Boydell, 1998). Interestingly, those not taking β -blocker medications had higher mean fatigue scores on the majority of the items on the RPFS, including significantly higher mean scores on the affective dimension. These results may indicate that those on β -blockers successfully reversed remodeling after MI and, therefore, had less fatigue. Additional studies are needed to examine the symptoms of fatigue and depression over time after MI and examine other variables, such as selectivity and lipid solubility, which may influence these symptoms.

Limitations

The results of this study should be viewed in light of the limitations. Using a convenience sample of predominately White women limits the generalizability of the findings. Because a cross-sectional design was used, no prior information was available related to prior β -blocker usage. Further, no information was collected to determine the possible reasons for depression. Finally, while differences between groups were noted, they were not statistically significant. Therefore, the sample size may have affected the results. Increasing the sample size in future studies is warranted.

Implications for nurse practitioners

Most of the women in the sample were either overweight or obese. Because obesity is a risk factor for cardiac events, nurses must be thorough in assessing risk and providing support for weight reduction. This may include dietary counseling, assessing barriers to participation in physical activity, and monitoring of weight over time.

Nurse practitioners must be diligent in explaining the benefits of β -blockers after MI as well as the potential side effects. This is especially important in older adults who have a decrease in their short-term memory that may affect retention of new information (Weinrich, Boyd, & Nussbaum, 1989). Therefore, education at each visit as well as simple written information is important. Because research indicates that adherence to β -blocker medication after MI decreases over time and that those older than 75 years were less likely to fill a prescription compared to those less than age 65, determining the specific medications prescribed upon discharge from the hospital after MI would be critical for the nurse practitioner resuming care following hospitalization (Butler et al., 2002).

The proportion of depression in older women after MI emphasizes the importance of continually assessing older women for depression 6–12 months post-MI. Because no difference was noted in depression scores of women using β -blockers compared to nonusers, depression should not be a barrier for prescribing β -blockers after MI. Nurse practitioners should also explore with all women taking β -blockers post-MI ways to overcome fatigue while remaining on the β -blocker medication to assure the overall benefits of β -blocker medication.

For many older women, the initial MI may be the first time they are diagnosed with coronary heart disease, given that women may have atypical symptoms prior to MI (McSweeney & Crane, 2000), which could result in inadequate primary prevention. β -Blockers are just one of the mainstays of secondary prevention of MI (Hanna & Wenger, 2005). Subsequent visits with older female MI survivors need to include review of all secondary preventive measures such as exercise, smoking cessation, and diet as well as medication adherence. Evaluating the need for psychosocial intervention for these women is also important given the high rates of depression experienced by women with coronary heart disease. Nurse practitioners managing the care of older women are in pivotal positions to monitor the ongoing physiological as well as psychological sequelae post-MI and implement interventions to improve their outcomes after MI.

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