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Medication taking behaviors among breast cancer patients on adjuvant endocrine therapy

Gretchen Kimmick¹, Sara N. Edmond², Hayden B. Bosworth³, Jeffrey Peppercorn¹, Paul K. Marcom¹, Kimberly Blackwell¹, Francis J. Keefe², and Rebecca A. Shelby²

¹Duke Cancer Institute, Duke University Medical Center, DUMC Box 3204, Durham, NC 27710

²Department of Psychiatry and Behavioral Sciences, Duke University Medical Center, Durham VAMC

³Department of Medicine, Psychiatry, and School of Nursing, Duke University Medical Center; Center for Health Services Research, Durham VAMC

Abstract

Purpose—To explore how symptoms and psychosocial factors are related to intentional and unintentional non-adherent medication taking behaviors.

Methods—Included were postmenopausal women with hormone receptor positive, stage I-IIIa breast cancer, who had completed surgery, chemotherapy, and radiation, and were taking endocrine therapy. Self-administered, standardized measures were completed during a routine clinic visit: Brief Fatigue Inventory, Brief Pain Inventory, Menopause Specific Quality of Life Questionnaire, Functional Assessment of Cancer Therapy General and Neurotoxicity scales, and Self-Efficacy for Appropriate Medication Use Scale. Regression analyses were performed to determine the degree to which demographic, medical, symptom, and psychosocial variables, explain intentional, such as changing one's doses or stopping medication, and unintentional, such as forgetting to take one's medication, non-adherent behaviors.

Results—Participants were 112 women: mean age 64 (SD=9) years; 81% white; mean time from surgery 40 (SD=28) months; 49% received chemotherapy (39% including a taxane); mean time on endocrine therapy, 35 (SD=29.6) months; 82% taking an aromatase inhibitor. Intentional and unintentional non-adherent behaviors were described in 33.9% and 58.9% of participants, respectively. Multivariate analysis showed that higher self-efficacy for taking medication was associated with lower levels of unintentional ($p=0.002$) and intentional ($p=0.004$) non-adherent

Corresponding author: Gretchen Kimmick, MD, MS, DUMC Box 3204, Durham, NC 27710, Phone: 1-919-668-0718, Fax: 1-919-684-4221, gretchen.kimmick@duke.edu.

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The work was approved by the Institutional Review Board of Duke University School of Medicine and complies with the journal's policy on ethical consent.

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behaviors. The presence of symptoms ($p=0.03$) and lower self-efficacy for physician communication ($p=0.009$) were associated with higher levels of intentional non-adherent behaviors.

Conclusions—These results suggest that women who report greater symptoms, lower self-efficacy for communicating with their physician, and lower self-efficacy for taking their medication are more likely to engage in both intentional and unintentional non-adherent behaviors.

Keywords

breast cancer; endocrine therapy; adherence; self-efficacy

INTRODUCTION

Adjuvant endocrine therapy is the most effective systemic preventive measure for women with early-stage, hormone receptor positive breast cancer. The magnitude of benefit in decreasing breast cancer recurrence and mortality rates far surpasses that seen with adjuvant chemotherapy.(1) Yet, adherence to adjuvant endocrine therapy, which is prescribed as a daily oral tablet, is not optimal – even in the clinical trial setting.(2, 3) Up to 50% of women will stop taking the prescribed medication by the 5th year of planned therapy.(4) As time passes after starting endocrine therapy, there is less adherence(4–6); Partridge et al showed that 13% of patients fill less than 80% of their prescription during the first year and that this proportion increases to 80% during the 4th year.(4) Furthermore, there is growing data showing that better adherence to endocrine therapy leads to higher survival rates.(7–9) Interventions that help patients adhere to prescribed endocrine therapy are needed.

The design of successful interventions to improve adherence hinges on the presence of targetable, modifiable causes of nonadherence. Studies have shown that there are demographic and clinical factors associated with nonadherence, which include age (10, 11), low socioeconomic status(12), and comorbidity and use of other prescription medications(10, 13), but these are not modifiable. Patient- and physician-related factors, such as lack of physician recommendation and patient perceived low risk for recurrence also contribute(14) to nonadherence, though improved patient education has, thus far, not been found to produce significantly better adherence.(15) Side effects also play a role in nonadherence (16–18); but there are currently no studies testing whether interventions designed to manage side effects can enhance adherence.

Self-efficacy for taking one's medications may be an important factor in understanding adherence to adjuvant endocrine therapy(19–24), and is a modifiable factor that could be targeted to improve adherence(25–28). Self-efficacy refers to confidence in one's ability to successfully engage in or perform a specific behavior or task (e.g. to engage in medication taking behavior).(29) According to social cognitive theory, self-efficacy influences engagement in behavior and persistence when faced with barriers(29), and is considered an important part of successful disease management²⁶ and, therefore, may be a modifiable factor in nonadherence to adjuvant endocrine therapy.

The aim of this pilot study was to further understand the non-adherent medication taking behaviors of women taking adjuvant endocrine therapy. Specifically, we were interested in how symptoms and psychosocial factors (e.g. self-efficacy for taking medication, beliefs about taking medication, and self-efficacy for communicating with one's physician) were related to non-adherent medication taking behaviors.

METHODS

Participants

Women were recruited from the Duke Cancer Institute Multidisciplinary Breast Cancer Clinic. Eligible participants were post-menopausal, women, diagnosed with Stage I-III hormone-receptor positive breast cancer, who completed surgery, chemotherapy, and/or radiation, were currently taking endocrine therapy (i.e., tamoxifen or an aromatase inhibitor), and able to provide meaningful consent. This study was approved by the university Institutional Review Board.

Of the 143 women who were approached, 87% (N=125) agreed to participate. Thirteen participants were excluded from data analyses: one had not completed surgical treatment and twelve did not complete study measures (i.e., too many missing items to compute scores for the well-being and/or symptom measures). The final sample included 112 women. There was no significant difference in demographic variables (p values $\geq .18$) between participants included and those excluded due to missing data, but excluded women were more likely to have mastectomy (75% vs. 45%, $p=.05$) and less likely to have undergone chemotherapy (17% vs. 53%, $p=.02$).

Procedure

Prospective participants were mailed letters describing the study and were given a phone number to call for information or to decline further contact with the study. Prospective participants who did not decline further contact were approached by a research assistant in the clinic on the day of their appointment. After completing informed consent, participants completed self-report questionnaires. Information regarding breast cancer and medical comorbidities was obtained from the participant's medical record. Women were given \$10 for participating in the study.

Measures

Physical Symptoms—Four measures were used to assess symptom domains of pain, fatigue, vasomotor symptoms, and neuralgia/arthritis. 1) *Pain*. The Pain Intensity Scale of the Brief Pain Inventory Short-Form (BPI-SF) (30) was used to assess levels of pain in the past week. In the present study, this scale had high internal consistency (Cronbach's $\alpha = 0.92$). 2) *Fatigue*. Women completed three items from the Brief Fatigue Inventory (31) that measured present level of fatigue, worst fatigue in the past week, and usual level of fatigue in the past week. The three items were averaged to create a total score ranging from 0 to 10, with higher scores indicating greater fatigue. This scale had high internal consistency in the present sample (Cronbach's $\alpha = 0.93$). 3) *Vasomotor symptoms*. The Vasomotor Subscale of the Menopause Specific Quality of Life Questionnaire (MENQOL)(32) was used to

assess occurrence and severity of vasomotor symptoms. Cronbach's alpha was 0.90. 4) *Neuralgia and arthralgia*. Symptoms of neuralgia and arthralgia were assessed using the 16-item Functional Assessment of Cancer Therapy - Taxane (FACT-T) questionnaire (33). Taxane chemotherapy was received by forty-one participants. In this sample, the internal consistency was high (Cronbach's alpha = 0.88).

An overall symptom composite score was calculated from these measures. Intercorrelations among the four measures ranged from $r=.37$ to $r=.70$. The symptom composite score was calculated in three steps. First, total scores for each measure were computed. Next, standardized scores (Z scores) with a mean of 0 and a standard deviation of 1 were computed for each measure. Finally, standard scores of the four measures were averaged. Composite scores ranged from -1.33 to 3.03. Cronbach's alpha for the composite scale was 0.81.

Self-Efficacy for Taking Medications—A modified version of the Self-Efficacy for Appropriate Medication Use Scale (SEAMS) (34) was used to assess women's confidence in their ability to take their adjuvant hormonal therapy as prescribed in various circumstances. For this study, the response scale used for each item was modified to be consistent with recommendations for measuring self-efficacy (ref Lorig below; this study used a 10 (not confident) to 100 (very confident) item response scale instead of the 3-point scale used in original SEAMS. The modified SEAMS had a Cronbach's alpha = 0.95 in this sample and demonstrated the same factor structure identified in the original SEAMS.(35)

Beliefs about Medicines Questionnaire—The Beliefs about Medicines Questionnaire (BMQ)(36) was used to assess beliefs about adjuvant endocrine therapy. The original five-item BMQ perceived necessity scale was used. The BMQ concerns scale was modified by removing one item (i.e., "*I sometimes worry about becoming too dependent on my medicine*") resulting in a four-item scale. Patients rated their degree of agreement with each of the statements on a 1 (strongly agree) to 5 (strongly disagree) scale, and individual item scores were summed to create a total necessity score and a total concerns score. The BMQ necessity scale had a Chronbach's alpha = 0.85 in this sample and the modified BMQ concerns scale had a Chronbach's alpha = 0.65 in this sample.

Self-Efficacy for Communication with medical providers—The Perceived Efficacy in Patient-Physician Interactions (PEPPI) (37) assessed women's perceived ability to communicate with their physician. Cronbach's alpha for the scale in this study was 0.94.

Medication Taking Behavior—The Morisky Medication Adherence Scale (MMAS)(38) and eight additional items were used to assess medication-taking behavior related to adjuvant hormonal therapy (e.g, forgetting to take medication, skipping doses, reducing or stopping medication when feeling better, and reducing or stopping medication when feeling worse). Each of the items is rated on a 1 (very often) to 5 (never) scale, and then response choices were collapsed into "never" versus "rarely/sometimes/often/very often." (refs Krousel-Wood and Ogedegbe below).(39, 40) Items were divided into two categories: intentional non-adherent behaviors such as changing one's doses or stopping medication, and unintentional non-adherent behaviors such as forgetting to take one's medication. Each

category was given a count score based on the number of behaviors women admitted to engaging in at least some of the time. For unintentional non-adherent behaviors Kuder-Richardson internal consistency reliability was 0.80 in this sample and for intentional non-adherent behaviors Kuder-Richardson internal consistency reliability was 0.83 in this sample.

Control variables

Demographic and Medical Information—All participants completed a questionnaire assessing demographic characteristics, including age, race, education, and marital status. Medical records were abstracted to determine current and past endocrine therapies, breast surgery type and date, and receipt of chemotherapy and radiation). *Medical comorbidities.* Comorbidity level was determined from chart review using the Adult Comorbidity Evaluation Scale (ACE-27). (41)

Data Analysis Plan

Descriptive statistics were calculated for all variables. Correlational analyses were conducted to examine the relationship between demographic, medical, and study variables. Because the measures of non-adherent behaviors were count variables (i.e. number of behaviours), Spearman's Rho was used in correlational analyses. Participant demographic and medical characteristics that were significantly ($p < .05$) associated with non-adherent behaviors were controlled for in subsequent regression analyses. Since our dependent variables were also count variables, Poisson regression analyses were then conducted to examine the relationship between symptoms, psychosocial variables, and non-adherent behaviors. Poisson regression analyses report exponentiated beta weights, which can be interpreted similar to odds ratios. Separate regression models were conducted for the outcomes of intentional and unintentional non-adherent behaviors. Each regression model included demographic and medical control variables, symptoms, and psychosocial variables.

RESULTS

Sample Description

The mean age of the 112 women sample was 63.7 years ($SD=8.9$, range 45.0–84.0). Most women were married (66.1%), had a college degree or greater education (57.3%), and were White (81.3%) and non-Hispanic (95.6%).(Table 1) Rates of mastectomy, radiation, and chemotherapy were 44.6%, 75%, and 52.7%, respectively. The type of endocrine therapy was an AI in most (82.1%); 37 (33%) took letrozole, 36 (32.1%) took anastrozole, and 19 (17%) took exemestane. The mean time on endocrine therapy was 35 months ($SD=29.6$ months, range 0.1–130.3 months) and the mean time on current endocrine therapy was 26.0 months ($SD 21.8$, range 0.0–97.8 months).

Overall, 58.9% reported unintentional and 33.9% reported intentional non-adherent medication-taking behaviors. Regarding unintentional non-adherent behaviors, 63 (56.3%) reported that they had forgotten to take their medication on a busy day. Additionally, 33 (29.7%) reported they had missed taking their medication because they were away from home, 21 (16.9%) reported that they had missed taking their medication because of

problems getting refills. With regard to intentional non-adherent behaviors, 27 (21.8%) reported changing or adjusting the dose of their medication, 22 (17.7%) reported not taking their medication because they felt worse or experienced side effects, 16 (14.4%) stopped taking the medicine because it made them feel worse, and 15 (12.1%) skipped doses because of cost.

Bivariate Analyses

Correlational analyses were conducted to examine the relationship between demographic and medical variables and non-adherent behaviors. Age was inversely associated with engaging in unintentional non-adherent behaviors ($r_s = -0.23$, $p=0.02$), while white race ($r_s = 0.20$, $p=0.04$) and higher comorbidity level ($r_s = 0.20$, $p=0.04$) were related to engaging in intentional non-adherent behaviors. (Table 2) These three demographic variables were controlled for in subsequent analyses multivariate analyses.

We next used correlational analyses to examine the relationship between symptoms, psychosocial factors, and non-adherent behaviors. Physical symptoms were not related to unintentional non-adherent behaviors (0.16 ($p=NS$), but higher levels of physical symptoms were related to greater intentional non-adherent behaviors ($r_s = 0.26$, $p=0.007$). Lower self-efficacy for taking one's medication was significantly related to both greater unintentional ($r_s = 0.37$, $p<0.001$) and intentional ($r_s = 0.34$, $p<0.001$) non-adherent behaviors (see Table 3). In terms of beliefs, having more concerns about taking one's medications was significantly related to both higher levels of unintentional ($r_s = 0.19$, $p=0.04$) and intentional ($r_s = 0.23$, $p=0.02$) non-adherent behaviors. Lower self-efficacy for communicating with one's physician was related to both higher levels of unintentional ($r_s = 0.24$, $p=0.01$) and intentional ($r_s = 0.35$, $p<0.001$) non-adherent behaviors.

Correlations between physical symptoms and psychosocial variables were explored. Physical symptoms were positively correlated with concerns about taking medications ($r_s = 0.46$, $p<0.05$) and negatively correlated with self-efficacy for communicating with one's physician ($r_s = -0.20$, $p<0.05$). Higher self-efficacy for taking one's medication was significantly related to fewer concerns about taking one's medication ($r_s = -0.32$, $p<0.05$) and higher self-efficacy for communicating with one's physician ($r_s = 0.28$, $p<0.05$).

Regression Analyses

Poisson regression analyses (Table 4) were conducted to examine the relationship between physical symptoms, psychosocial variables, and non-adherent behaviors. After controlling for demographic variables, self-efficacy for taking medication was the only significant predictor of unintentional non-adherent behaviors ($\text{Exp}(B)=0.97$, $p=0.002$), such that women with higher self-efficacy for taking their medication were less likely to report unintentional non-adherent behaviors. Regression analyses also showed that, after controlling for demographic variables, self-efficacy for taking medication was significantly related to intentional non-adherent behaviors ($\text{Exp}(B)=0.98$, $p=0.004$), suggesting that women with higher self-efficacy for taking their medication were less likely to engage in intentional non-adherent behaviors. There was also a trend for physical symptoms ($\text{Exp}(B)=1.45$, $p=0.09$) and self-efficacy for physician communication ($\text{Exp}(B)=0.98$, $p=0.06$) to be related to

intentional non-adherent behaviors, such that women with higher levels of symptoms and lower self-efficacy for communicating with their physicians engaged in more non-adherent behaviors.

Due to concerns of multicollinearity (i.e., overlap between concerns about taking medication and physical symptoms), we also ran the regression models without the concerns about taking medication variable. For the model predicting unintentional non-adherent behaviors, self-efficacy for taking one's medication remained significant ($\text{Exp}(B)=0.99$, $p=0.002$). Additionally, there was a trend found for a relationship between physical symptoms and unintentional non-adherent behaviors ($\text{Exp}(B)=1.23$, $p=0.06$). With the removal of concerns about taking one's medication from the regression model, higher levels of physical symptoms ($\text{Exp}(B)=1.51$, $p=0.03$), lower self-efficacy for physician communication ($\text{Exp}(B)=0.98$, $p=0.009$), and lower self-efficacy for taking medication ($\text{Exp}(B)=0.98$, $p=0.002$) were all significantly related to higher levels of intentional non-adherent behaviors. These results suggest that women who report more symptoms, lower self-efficacy for communicating with their physician, and lower self-efficacy for taking their medication are more likely to engage in intentional non-adherent behaviors, such as adjusting their dose or discontinuing medication if they are feeling worse.

DISCUSSION

In this group of breast cancer survivors taking endocrine therapy, a significant proportion of women reported nonadherent medication-taking behaviors. The most commonly reported non-adherent behaviors were unintentional, but intentional non-adherent behaviors were also commonly reported. Given the great efficacy of adjuvant endocrine therapy and the realization that poor adherence to treatment may blunt the beneficial effect, identification of causes of low adherence, particularly those that are modifiable, is of critical importance. In multivariate analysis, we found that self-efficacy for taking medication was significantly associated with both unintentional and intentional adherence behaviors. There was a trend towards an association between self-efficacy for patient-physician communication and intentional nonadherent behaviors.

Self-efficacy for taking medications refers to patients' confidence in their ability to take a medication correctly and under difficult circumstances (e.g., when away from home, experiencing side effects, having multiple medications to take).⁽³⁴⁾ Individuals can improve their self-efficacy by having easy access to educational materials, including reminders. Techniques such as direct mastery experiences and vicarious experiences (e.g. observing others perform an activity) are effective methods for increasing self-efficacy for a specific task too. ⁽²⁹⁾ A recent review of self-efficacy for managing pain in the context of arthritis reported that several behavioral interventions demonstrated increased levels of self-efficacy for managing arthritis pain pre- to post-intervention and that these changes were concurrent with decreased joint pain and improved physical functioning.⁽⁴²⁾ Future work should explore interventions aimed at increasing self-efficacy for taking medications as a possible way to improve medication adherence in this population.

The physician-patient relationship and quality and frequency of communication are important predictors of adherence.(17, 43–46) Providing patients with written materials about medication taking is not sufficient; direct provider-patient communication must be good.(47, 48) Some suggest that patient education by physicians and nurses through regular follow-up can improve adherence to adjuvant endocrine therapy (16, 18), but strong evidence is lacking.(49) In part this may represent the fact that most patient education focuses on simply providing patients with information (e.g. written handouts) and does not focus on enhancing important skills such as communicating with one's physicians, developing reminders for medication taking, and ongoing monitoring of medication taking. Arriola and colleagues, for example, found a significant relationship between frequency of communications with one's physician and adjuvant endocrine therapy adherence.(46) Cluze et al also showed that there were less tamoxifen treatment interruptions if patients were given a chance to ask questions about their treatment at diagnosis.(50) Our finding that self-efficacy for communicating with physicians(37) is associated with intentional nonadherent behaviors is consistent what is reported in the literature, though, in this cross-sectional study we cannot rule out there being other factors, including the adherent behavior itself, mediating the level of self-efficacy for communicating with physicians. An important direction for future research is to explore the effects of interventions directed to teaching the patient strategies to improve communication with their medical provider. Since each patient may require different information and support, teaching the patient how to request information and communicate may be more effective than intervening at the level of the provider.

Prior studies have found that predictors of nonadherence to endocrine therapy include demographics, such young and old age, nonwhite race, higher level of comorbidity, presence of cognitive impairment, and disease related factors, including nodal status, type of surgery, and use of chemotherapy.(4, 51) In addition, follow-up care with an oncologist, versus a general practitioner, lower out-of-pocket cost and longer prescription fill interval, 90-day vs 30 day prescription, are associated with better adherence.(6, 52)(16, 53, 54) Psychological factors, such as beliefs, perception, education, source and quality of information, social support, have also been shown to contribute.(14, 16, 18, 55) Although a diagnosis of cancer and the fear of recurrence have been reported by patients as reasons for better adherence(56), higher cancer stage and, thus, higher risk of recurrence, has not been consistently associated with better adherence.(12) The patients' inherent beliefs about the medicine and side effects also have an impact on adherence rates.(57–61) Thus, in order for physicians to enhance adherence, individually crafted rationales for taking medication that are consistent with the patient's beliefs may be necessary.(57)

It is thought that the most common reasons for stopping endocrine therapy are side effects and reduced quality of life (62, 63) and, thus, that better ways to manage side effects will improve adherence. In truth, however, side effects of endocrine therapy have proven difficult to manage and are rarely adequately addressed by medical providers. Kahn et al showed that patient-centered communication, which includes discussion about the side effects, was a positive predictor of patient adherence to tamoxifen.(17) In a study by Wuensch and colleagues, lack of communication about side effects was associated with lower adherence to endocrine therapy.(48) In that study, 76% of participants reported side effects that limited

daily function and 60% indicated that physicians did not react to the side effects of treatment. Furthermore, although receiving detailed answers to questions was related to better adherence, only 12.8% of surveyed patients indicated that their questions regarding medication were fully answered, and only 10.3% reported that side effects were explained thoroughly. In our pilot study, the measure of physical symptoms was not significantly correlated with unintentional non-adherence behaviors; the association neared was significant for intentional non-adherence in bivariate correlations. Increased symptoms did correlate with lower self-efficacy for communicating with the physician and with higher concern about taking medication. In multivariate analysis, however, the symptom composite score was not significantly correlated with adherence behaviors. We believe that this is a result of the fact that the BMQ concerns score is primarily drawn from physical symptoms and there hence was a correlation between the two variables. We agree that a patient-centered approach to discussing adjuvant endocrine therapy, in which the physician engages the patient in education about benefits and side effects of treatment, leads to better adherence rates.(17, 45, 50) Future work is being developed in this area.

As this was a pilot study, there are inherent weaknesses as a result of the small sample size and breadth of data collected. The small size leads to low power to find statistically significant association, as we suspect may be the case with the symptom index. The study group was also primarily older, so menopausal symptoms characteristically associated with anti-endocrine therapy might have been less of a problem compared to the challenge they pose for adherence among younger women with breast cancer. The participants were also on treatment different lengths of time, with the median time on treatment of over one year, so they may represent a population in whom endocrine therapy caused less side effects. However, this population is still highly relevant to understand barriers to completion of 5 years of endocrine therapy. The study is also subject to ascertainment bias, because participants were recruited from one institution and were willing to participate and complete study questionnaires. Adherence behaviors were assessed by self-report only, which may underestimate their frequency and cannot be directly correlated with actual adherence. Additional research is needed to better identify and differentiate intentional vs. non-intentional non-adherence. In addition, studies using other methods of measurement (e.g., MEMs) could be used to identify the relationship between self-report responses regarding frequency of non-adherent behaviors and actual frequency of these behaviors. We suspect, however, that there is a direct correlation between true adherence and reported adherence behaviors. The cross-sectional study design and our use of standardized instruments are strengths, as we were able to exploration of correlations between variables in order to direct future work.

In conclusion, women who report greater symptom burden, lower self-efficacy for communicating with their physician, and lower self-efficacy for taking their medication are more likely to engage in both intentional and unintentional non-adherent behaviors. Although there is strong evidence that better adherence to adjuvant endocrine therapy leads to better survival, rates of adherence fall far below 100%.(8, 64) Improving patient-physician communication through interventions directed to the medical provider and the patient, to allow for better shared decision-making show promise toward improving adherence to adjuvant endocrine therapy and, ultimately, improving breast cancer survival rates. Future

work exploring ways to improve self-efficacy for medication taking and perceived self-efficacy for patient-physician interactions and the effect of these interventions on medication taking behaviors are needed.

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Table 1

Descriptive Statistics (n=112)

Characteristic	Mean (SD)	Range	N (%)
Age	63.7 (8.9)	45.0–84.0	
Married			74 (66.1)
Education			
Some high school			6 (5.5)
Finished high school			19 (17.3)
Vocational Training / Some college			22 (20.0)
College degree			34 (30.9)
Graduate degree			29 (26.4)
Race			
White			91 (81.3)
African American			17 (15.2)
Other			4 (3.6)
Ethnicity			
Hispanic			4 (3.6)
Non Hispanic			87 (77.7)
Stage			
Stage I			43 (38.4)
Stage II			56 (50.0)
Stage III			13 (11.6)
Surgery Type			
Lumpectomy			62 (55.4)
Mastectomy			50 (44.6)
Time from Surgery (Months)	40.7 (29.3)	2.8–134.4	
Chemotherapy (% yes)			59 (52.7)
Radiation (%)			84 (75.0)
Type of Endocrine Therapy			
Tamoxifen			20 (17.9)
AI			92 (82.1)
Months on current endocrine therapy (Months) *	26.0 (21.8)	0.0–130.3	
Months on any endocrine therapy (Months) *	35.0 (29.6)	0.1–130.3	
ACES Comorbidity index			
0			40 (35.7)

Characteristic	Mean (SD)	Range	N (%)
1			49 (43.8)
2			17 (14.3)
3			7 (6.3)
Fatigue	4.0 (2.9)	0.0–9.7	
Pain Intensity	1.8 (2.2)	0.0–8.5	
MENQOL Vasomotor*	3.2 (2.1)	1.0–8.0	
Neurotoxicity (FACT-T)***	11.8 (10.6)	0.0–51.0	
Symptom Composite (Z Score)	0.0 (1.0)	–1.3–3.0	
PEPPI**	92.1 (10.6)	48.0–100.0	
BMQ Necessity**	15.7 (4.7)	5.0–25.0	
BMQ Concern**	10.1 (3.3)	4.0–17.0	
Self-efficacy for taking medication (SETM)**	85.9 (18.0)	10.0–100.0	

* N=108

** N=111

*** N=107

Table 2

Types and frequency of non-adherent behaviors (n=112)

Behavior	N (%)
<i>Unintentional</i>	66 (58.9)
Forgetting on a busy day	63 (56.3)
Miss because you were away from home	33 (29.7)
Problems with refills	21 (16.9)
Confused about taking multiple medications	12 (10.7)
Miss doses because of difficulty swallowing	5 (4.5)
<i>Intentional</i>	38 (33.9%)
Changed/adjusted doses	27 (21.8)
Felt worse or had side effects	22 (17.7)
Stop taking because you feel worse	16 (14.4)
Skip because of cost	15 (12.1)
Stop taking because you feel better	8 (7.4)
Stop taking because you would rather use other treatments	6 (5.4)

Table 3

Correlational Analyses (Spearman's Rho)

	Unintentional	Intentional
Age	-0.23 *	-0.04
Marriage	0.04	-0.16
Education	0.08	-0.05
Race	-0.07	0.20 *
Ethnicity	0.14	-0.12
Time since surgery	0.12	-0.01
Time on current meds	0.06	-0.05
Time on any meds	0.10	0.05
Tam vs AI	0.08	0.05
Surg Type	-0.02	-0.02
TNM Stage	-0.09	0.01
ACES	0.10	0.20 *
BFI	0.15	0.24 *
Pain Intensity	0.08	0.29 *
MENQOL Vasomotor	0.15	0.17
FACT T	0.17	0.21 *
Symptom Composite	0.16	0.26 *
PEPPI	-0.24 *	-0.35 *
BMQ Necessity	0.07	0.11
BMQ Concern	0.19 *	0.23 *
SETM	-0.37 *	-0.34 *

Note: The following dummy codes were used in analyses: Marriage: 0=Unmarried, 1=Married; Race: 0=White, 1=Non-White; Ethnicity: 0=Non-Hispanic, 1=Hispanic; Surgery type: 0=Lumpectomy, 1=Mastectomy; Tam vs. AI: 0=Tamoxifen, 1=AI.

*
p < 0.05

Table 4

Poisson Regression

Variable	Exp(B)	Lower	Upper	P
Outcome: Unintentional				
Age	0.97	0.94	0.99	0.003
Race (white vs nonwhite)	1.15	0.63	2.09	0.65
Comorbidity *	1.02	0.75	1.38	0.91
Symptom Composite	1.18	0.91	1.52	0.22
Efficacy in communicating with physician	0.99	0.97	1.02	0.56
Concerns about medicine	1.04	0.96	1.12	0.32
Self efficacy for taking medication	0.97	0.98	0.99	0.002
Outcome: Intentional				
Age	0.98	0.94	1.01	0.18
Race=0 (vs.=1)	0.99	0.45	2.18	0.97
Comorbidity *	1.13	0.71	1.81	0.60
Symptom Composite	1.45	0.95	2.24	0.09
Efficacy in communicating with physician	0.98	0.96	1.00	0.06
Concerns about medicine	1.04	0.92	1.18	0.53
Self efficacy for taking medication	0.98	0.97	0.99	0.004

* comorbidity by ACE score; Efficacy in communicating with physician by PEPPI; Concerns about medicines by modified BMQ;