



# Sociodemographic, clinical, psychosocial, and healthcare-related factors associated with beliefs about adjuvant endocrine therapy among breast cancer survivors

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## Abstract

**Objective** Adjuvant endocrine therapy (AET) reduces the risk of recurrence and mortality in women with hormone receptor-positive breast cancer. However, adherence to AET remains suboptimal. Women's beliefs about medication have been associated with medication adherence. The purpose of this study was to identify multilevel factors associated with women's beliefs about AET.

**Methods** Beliefs about AET, measured using the Belief about Medicines Questionnaire (BMQ), sociodemographic (e.g., age), psychosocial (e.g., religiosity), and healthcare factors (e.g., patient-provider communication), were collected via survey. Clinical data were abstracted from medical records. Two stepwise regression analyses models were performed to assess relationships between variables and necessity and concern beliefs.

**Results** In our sample of 572 women, mean BMQ concern score was 11.19 and mean necessity score was 13.85 (range 5–20). In the regression models, higher ratings of patient-provider communication were associated with lower concern and higher necessity beliefs. Higher concern beliefs were related to more AET-related symptoms ( $B = 0.08$ ; 95% CI 0.06 to 0.10;  $p < 0.001$ ), lower patient satisfaction ( $B = -0.07$ ; 95% CI  $-0.09$  to  $-0.04$ ;  $p < 0.001$ ), and higher religiosity ( $B = 0.05$ ; 95% CI 0.01 to 0.08;  $p = 0.007$ ). Higher necessity beliefs were associated with prior chemotherapy use ( $B = 0.11$ ; 95% CI 0.06 to 0.16;  $p < 0.005$ ) and less education ( $B = 1.00$ ; 95% CI 0.27 to 1.73;  $p = 0.008$ ).

**Conclusions** Modifiable factors are related to women's AET beliefs. Healthcare interactions may play a key role with regard to shaping women's beliefs about their AET medication.

**Keywords** Adjuvant endocrine therapy · Beliefs about Medicines · Breast cancer · Patient-provider communication

## Introduction

Breast cancer remains the most frequently diagnosed cancer in the United States [1]. Survival rates have improved over the years due to advances in screening, early detection, and treatment. Treatment modalities for breast cancer may include surgery, radiation therapy, chemotherapy, and, following primary treatment, adjuvant endocrine therapy (AET). AET, prescribed for women who are diagnosed with hormone receptor-positive breast cancer, has been shown to reduce the risk of recurrence and mortality by 40% and 31%, respectively [2, 3]. While this therapy results in favorable outcomes when taken for the full course of five or more years [4, 5], initiation and discontinuation rates remain less than satisfactory, with studies indicating that 17–25% of women do not initiate therapy following a provider recommendation [6, 7] and up to 50% discontinue AET by year five [8, 9]. Factors associated with non-initiation

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or premature discontinuation of AET vary from financial constraints, AET-related symptoms, sociodemographic characteristics, and ambivalence about AET [10–13].

Beliefs about medications play a role in medication adherence in several chronic illnesses. Medication adherence is the action of taking a medication as prescribed. Medication beliefs, i.e., one's thoughts about their medication, include necessity and concern beliefs. The former include the level to which one believes that there is a need to take the medication to improve their health, and the latter include feelings of worry or skepticism toward medications. While high necessity beliefs have been associated with better adherence, greater concern beliefs have been linked to lower adherence in several chronic conditions [14, 15]. Similar patterns have been observed for AET, wherein higher necessity beliefs have been associated with women's decisions to initiate and adhere to AET [16, 17]. Conversely, women with lower perceived necessity [18, 19] and greater concerns [20] were more likely to be non-adherent to AET. Understanding the role of women's beliefs becomes even more salient as many women are recommended for extended AET up to 10 years [21]. Prior studies emphasized the importance of women's necessity beliefs on the likelihood of pursuing extended therapy [16].

Previous research identified sociodemographic and clinical characteristics associated with women's necessity and concern beliefs about AET [22]. However, to our knowledge, no studies to date have sought to understand how psychosocial factors, including religiosity, distress, and gender discrimination, as well as healthcare factors, such as patient-provider communication, healthcare satisfaction, and trust in healthcare providers, impact women's beliefs about AET. These factors have been explored within the context of other chronic illnesses, with studies in the area of inflammatory bowel disease showing that disease beliefs served as mediators between satisfaction with provider communication and adherence, and studies in rheumatoid arthritis identifying unsatisfactory patient-provider communication as a negative influencer of necessity beliefs about medicines [23]. Within the context of AET, it is evident that more information is needed to understand drivers of beliefs toward AET. Therefore, the aim of this study was to identify sociodemographic, clinical, psychosocial, and healthcare-related factors associated with necessity and concern beliefs about AET among breast cancer survivors.

## Methods

### Study design

These analyses were part of a large longitudinal cohort study ( $n = 592$ ) conducted between 2012 and 2017 that sought to understand factors related to women's AET adherence and discontinuation. The analysis presented in this paper is

cross-sectional. Women completed a survey either online or over the phone with trained clinical research assistants to collect sociodemographic and clinical characteristics, and psychosocial and healthcare-related factors. Medical records information was abstracted and pharmacy refill data were obtained to estimate adherence to AET. Women also had an opportunity to provide a biospecimen. Additional details, including sample size calculation, are provided elsewhere [24]. This secondary analysis study procedures were approved by the Georgetown University Institutional Review Board (IRB).

### Subjects and setting

Women diagnosed with hormone receptor-positive non-metastatic invasive breast cancer were recruited from three healthcare centers in Washington, D.C., Atlanta, GA, and Detroit, MI, following AET initiation. Eligible women were  $\geq 18$  years of age and filled a prescription for AET. All participants provided informed consent prior to study initiation. For the purpose of this analysis, only Black/African American or White women were included ( $n = 572$ ).

### Data collection

Baseline and annual follow-up telephone or online surveys were conducted to collect information about women's medication beliefs, sociodemographic and clinical characteristics, psychosocial factors, and experience with the healthcare system. Telephone surveys were completed by trained clinical research assistants and participants were encouraged to complete the entire survey during one phone call. Surveys took approximately one hour to complete. Constructs were assessed using previously validated scales, as detailed below.

**Medication beliefs** We adapted the Beliefs about Medicines Questionnaire (BMQ) to measure women's beliefs about AET [25]. The BMQ consists of 10-items scored on a 4-point Likert scale (1 = strongly disagree, 4 = strongly agree). Five items assess concerns with AET (e.g., "I sometimes worry about the long-term effects of my endocrine therapy medication") whereas the other five measure AET necessity beliefs (e.g., "My life would be very hard without my endocrine therapy medication"). Scores on each subscale range from 5 to 20, with higher scores indicating higher concern or necessity beliefs. The instrument presented strong internal consistency (Cronbach's alpha concern subscale = 0.75; Cronbach's alpha necessity subscale = 0.84).

### Sociodemographic and clinical characteristics

Sociodemographic variables collected included age, race, education, marital status, and household income. Clinical variables included type of AET received (tamoxifen or aromatase inhibitor), tumor stage, surgery type (e.g., lumpectomy,

mastectomy), prior chemotherapy or radiation treatment, and experience of side effects from AET assessed with the Functional Assessment of Cancer Therapy Endocrine Subscale (FACT-ES) [26]. The FACT-ES includes 24 items related to commonly reported AET symptoms (e.g., “I have hot flashes”), and responses are provided on a 5-point Likert scale. Scores range from 0 to 96, with higher scores indicating higher symptom burden. The scale has strong internal reliability (Cronbach’s alpha = 0.79).

**Psychosocial factors** The Communication and Attitudinal Self-Efficacy scale for cancer (CASE-cancer) is a 12-item 4-point Likert scale (1 = strongly disagree, 4 = strongly agree) with strong reliability (Cronbach’s alpha = 0.87) developed to assess individuals’ beliefs that they can effectively communicate to gather information (e.g., “If I don’t understand something, it is easy for me to ask for help”) [27]. Scores range between 12 and 48 and higher scores indicate greater self-efficacy. The CASE-cancer scale is composed of three subscales with scores ranging from 4 to 20 for each – positive attitude (Cronbach’s alpha = 0.85), obtaining information (Cronbach’s alpha = 0.79), and understanding and participating in care (Cronbach’s alpha = 0.72). Religiosity was assessed with a previously validated (Cronbach’s alpha = 0.95) 9-item 5-point Likert scale (e.g., “I rely on God to keep me in good health”), where higher scores indicate higher religiosity [28]. The Bird and Bogart’s discrimination scale was adapted to measure women’s experiences with racial (Cronbach’s alpha = 0.90) and gender discrimination (Cronbach’s alpha = 0.86) in the medical system [29]. Women responded to seven yes/no questions for each of the two scales (e.g., “Have you ever been treated with less courtesy than other people because of your race”, “Have you ever had a doctor or nurse not listen to what you were saying because of your gender”). Scores range from 0 to 7 with higher scores indicating stronger experiences with discrimination. Emotional (Cronbach’s alpha = 0.94) and tangible support (Cronbach’s alpha = 0.92) was measured using the Medical Outcome Survey; higher scores on each scale indicate more support [30]. Lastly, women’s levels of distress in the past week (including the day of the survey) were assessed using the distress thermometer, a visual analogue scale where 0 denotes “no distress” and 10 “extreme distress” [31]. Scores were categorized as low (0–4), medium (5–7), and high (8–10) distress.

**Healthcare factors** Satisfaction with the medical care received was assessed with the patient satisfaction questionnaire (PSQ-18). The PSQ-18 is comprised of 18 items (e.g., “The medical care I have been receiving is just about perfect”), with responses provided on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree) [32]. Scores range between 18 and 90 where higher scores indicate greater satisfaction

(Cronbach’s alpha = 0.88). Patient-clinician communication was assessed with Makoul’s 8-item communication scale (e.g., “The doctor fully explained the benefits of endocrine therapy”), where higher scores indicate better communication (Cronbach’s alpha = 0.80) [33]. The Primary Care Assessment Survey (PCAS) was used to measure women’s trust in the clinicians who provided care during cancer diagnosis and treatment (Cronbach’s alpha = 0.81) [34]. It consists of seven items (e.g., “I completely trust my doctor’s judgment about my medical care”) and responses are provided on a 4-point Likert scale (1 = strongly disagree, 4 = strongly agree). Transformed scores range between 0 and 100 and higher scores indicate greater trust in the clinician. Medical mistrust was assessed with LaVeist’s 7-item scale (e.g., “Mistakes are common in healthcare organizations”). Responses are provided on a 5-point Likert scale, with resulting scores ranging between 7 and 35 and higher scores denoting greater medical mistrust (Cronbach’s alpha = 0.80) [35].

## Data analyses

Analysis was performed with baseline data from the large longitudinal cohort study [24]. Descriptive statistics were calculated to summarize sociodemographic, clinical, psychosocial, and healthcare-related variables, with means and standard deviations (SD) presented for continuous variables and frequencies and percentages for categorical variables. Multivariable linear regression analyses were performed to examine the association between necessity/concern beliefs (dependent variables) and sociodemographic/clinical characteristics, psychosocial, and healthcare-related factors (independent variables). A stepwise selection method was applied to the linear regression models, while race and age were constrained. All tests were two-sided with a type I error  $\alpha = 0.05$ . *P* values were obtained through *F* tests. Statistical analyses were performed using SAS version 9.4 (SAS Institute Inc., Cary, NC).

## Results

Of the 572 women included in the analysis, most were over 50-years-old (76.9%), white (71.7%), had at least some college education (85.8%), were married (64.4%), and were taking an aromatase inhibitor (61.8%) (Table 1). Two thirds of women had prior radiation therapy, and slightly over half (60.5%) did not receive prior chemotherapy. Mean BMQ concern and necessity scores were 11.2 (SD = 2.9) and 13.8 (SD = 3.0), respectively. Women were relatively satisfied with their care (mean (SD) = 73.0 (9.3)) and over half (56.6%) reported low levels of distress (Table 2).

In the multivariable regression model, neither age nor race was a predictor of women’s concern ( $p = 0.103$  and  $p = 0.115$ ,

**Table 1** Sociodemographic, clinical, psychosocial, and healthcare-related factors ( $N = 572$ )

	<i>n</i> (%) or <i>n</i> (mean ± SD)
Age	
> 50 years	440 (76.9)
≤ 50 years	132 (23.1)
Race	
Black	162 (28.3)
White	410 (71.7)
Education	
Less than college	80 (14.2)
College or above	485 (85.8)
Marital status	
Married	367 (64.4)
Single	203 (35.6)
Household income	
< USD100,000/year	268 (50.0)
≥ USD100,000/year	269 (50.0)
AET therapy	
Aromatase inhibitor	352 (61.8)
Tamoxifen	216 (38.2)
Tumor stage	
Stage I	304 (61.0)
Stage II	152 (30.5)
Stage III	42 (8.5)
Surgery type	
Lumpectomy	238 (51.2)
Mastectomy	198 (42.6)
Both	25 (5.4)
No surgery	4 (0.8)
Chemotherapy	
Yes	212 (39.5)
No	325 (60.5)
Radiation therapy	
Yes	341 (67.1)
No	167 (32.9)
Distress level	
Low	321 (56.6)
Medium	169 (29.8)
High	77 (13.6)
Symptom burden (FACT-ES) (range = 0–92)	538 (18.2 ± 11.3)
BMQ concern score (range = 5–20)	567 (11.2 ± 2.9)
BMQ necessity score (range = 5–20)	546 (13.8 ± 3.0)
Medical mistrust (range = 7–35)	565 (20.4 ± 4.9)
Emotional support (range = 0–100)	570 (82.5 ± 18.4)
Tangible support (range = 0–100)	561 (80.4 ± 23.6)
Trust in provider (range = 0–100)	569 (78.6 ± 15.1)
Communication (range = 8–48)	572 (33.9 ± 4.9)
Patient satisfaction (PSQ-18) (range = 18–90)	543 (73.0 ± 9.3)
Self-efficacy (total) (range = 12–48)	572 (44.7 ± 4.0)
Understand and participation (range = 4–16)	572 (15.1 ± 1.4)

**Table 1** (continued)

	<i>n</i> (%) or <i>n</i> (mean ± SD)
Positive attitude (range = 4–16)	571 (14.4 ± 2.0)
Obtaining information (range = 4–16)	572 (15.2 ± 1.4)
Religiosity (range = 9–36)	571 (26.7 ± 7.5)
Gender discrimination (range = 0–7)	536 (0.5 ± 1.3)
Racial discrimination (range = 0–7)	566 (0.4 ± 1.3)

*SD*, standard deviation

respectively) or necessity beliefs ( $p = 0.135$  and  $p = 0.471$ , respectively). Greater concern beliefs were associated with household income higher than USD100,000 ( $B = 0.75$ ; 95% CI 0.27 to 1.23;  $p = 0.002$ ), more AET-related symptoms ( $B = 0.08$ ; 95% CI 0.06 to 0.10;  $p < 0.001$ ), poorer provider communication ( $B = -0.10$ ; 95% CI  $-0.15$  to  $-0.14$ ;  $p = 0.001$ ), lower patient satisfaction ( $B = -0.07$ ; 95% CI  $-0.09$  to  $-0.04$ ;  $p < 0.001$ ), and higher religiosity scores ( $B = 0.05$ ; 95% CI 0.01 to 0.08;  $p = 0.007$ ). Greater necessity beliefs were associated with having less than college education ( $B = 1.00$ ; 95% CI 0.27 to 1.73;  $p = 0.008$ ), prior chemotherapy use ( $B = 0.62$ ; 95% CI 0.09 to 1.15;  $p = 0.023$ ), and higher ratings of provider communication ( $B = 0.11$ ; 95% CI 0.06 to 0.16;  $p < 0.005$ ).

## Discussion

To the best of our knowledge, this is the first study to identify psychosocial and healthcare-related factors associated with beliefs about AET, in addition to sociodemographic and clinical characteristics. In our sample, higher necessity beliefs were associated with less than college education, poorer provider communication, and prior chemotherapy use, and greater concern beliefs were found in women who experienced more AET-related symptoms, those with higher religiosity scores, and those who reported lower ratings of patient-provider communication and patient satisfaction. Participants reported moderate levels of concern and necessity beliefs, consistent with those of a similar study [22].

Patient-provider communication was simultaneously associated with women's concern and necessity beliefs, with good communication resulting in higher necessity and lower concern beliefs. Given the relationship between medication beliefs and adherence [16–19], it could be hypothesized that effective communication improves adherence to AET [36] via modification of beliefs, although further studies are required to test this hypothesis. Communication is critical for clinicians to elicit women's beliefs and preconceived notions about AET and tailor their approach to reinforcing adherence to AET to each individual patient. For example, if a patient voices concerns about the side effects associated with AET,

**Table 2** Multiple regression models of BMQ concern and BMQ necessity

	BMQ Concern		BMQ Necessity	
	$\beta$ (95% CI)	<i>p</i> -value	$\beta$ (95% CI)	<i>p</i> -value
<b>Age (&gt;50 vs. ≤ 50)</b>	0.46 (-0.09, 1.01)	0.103	0.47 (-0.15, 1.09)	0.135
<b>Race (black vs. white)</b>	0.47 (-0.11, 1.04)	0.115	0.21 (-0.36, 0.78)	0.471
<b>Education (&lt;college vs. ≥ college)</b>			1.00 (0.27, 1.73)	0.008*
<b>Household Income (≥USD100k vs. &lt;USD100k)</b>	0.75 (0.27, 1.23)	0.002*		
<b>Chemotherapy (yes vs. no)</b>			0.62 (0.09, 1.15)	0.023*
<b>FACT-ES total Score</b>	0.08 (0.06, 0.10)	<0.001**		
<b>Provider Communication</b>	-0.10 (-0.15, -0.14)	0.001*	0.11 (0.06, 0.16)	<0.001**
<b>Patient Satisfaction (PSQ-18)</b>	-0.07 (-0.09, -0.04)	<0.001**		
<b>Religiosity</b>	0.05 (0.01, 0.08)	0.007*		

The *p* values were obtained through F tests. Gray-shaded fields indicate that a variable was only selected in one of the two models during the stepwise selection method (e.g., prior chemotherapy). “ $\beta$ ” represents beta coefficient estimate

CI confidence interval

\**p* < 0.01

\*\**p* < 0.001

potentially compromising adherence, clinicians may offer opportunities for the patient to communicate with the team on a more frequent basis, rather than during office visits only. There may be opportunities to educate patients about self-advocacy by asking their provider pertinent questions about their AET. Ideally, communication should occur on both sides of the patient-provider dyad. Patient education about AET may require a multidisciplinary approach by engaging all professionals (e.g., physicians, nurses, pharmacists) to address women’s beliefs about AET.

Higher necessity beliefs were identified in women with lower educational attainment. Similar findings were noted in a study seeking to understand factors associated with beliefs of patients with human immunodeficiency virus (HIV) [37]. Less educated women may be more likely to listen to their providers while women with more education may question their doctors’ assertions. Qualitative methods that explore how women of varying educational backgrounds interact with their providers may provide insight into this relationship.

Women who had prior chemotherapy reported significantly higher necessity beliefs than those who had not received chemotherapy. To our knowledge, this finding has not been reported in the literature. A potential explanation could be that women who had prior chemotherapy exhibit greater perceived severity of their disease than women who did not have prior chemotherapy. This heightened perceived severity may enhance their understanding of the need for recommended therapies. Additionally, as a result of receiving additional treatment, these women may have more interactions with providers who may, in turn, further explain the need for AET during discussions about chemotherapy.

Experience of AET-related symptoms was associated with greater concerns with medication. Side-effect experience is one of the most frequently reported reasons for non-adherence to and discontinuation of AET [38]. However, studies show that, even when women experience symptoms, they have better adherence when there is a good patient-provider communication [36, 39].

Women who had household incomes of at least USD100,000 reported higher concern beliefs than women with lower household incomes. Although education did not show a relationship with concern beliefs, ad hoc analysis showed that a greater proportion of women with an income of at least USD100,000 had a college education or higher compared with those with an income of less than USD100,000 (95.1% vs. 78.1%, respectively; *p* < 0.0001). Thus, these women may be more prone to conducting more extensive research about cancer and treatments.

Higher concern beliefs were identified in women who reported lower patient satisfaction. The PSQ-18 assessed women’s satisfaction with communication with their providers, but it also measures women’s satisfaction with accessibility to healthcare, affordability, and the technical ability of their providers [32]. This suggests that the healthcare experience as a whole, not just the patient-provider interaction, may contribute to shaping beliefs about medication. Future work should explore the role of patient satisfaction as a mediator between beliefs about medicines and adherence.

A new contribution to the literature is the finding that women with higher religiosity scores hold higher concern beliefs. A number of studies have explored the relationship between religiosity and medication adherence, but results were mixed

[40]. One study from the HIV literature found that individuals who were less likely to be adherent to their antiretroviral therapy reported high levels of religiosity. Individuals relied on scriptures, prophetic messages from spiritual leaders, and testimonies from others instead of their medication [41]. This finding may suggest the need to develop interventions to address concern beliefs by engaging religious leaders to integrate religion and medicine.

### Study limitations

Although this study has notable strengths, such as demographic diversity of the sample and the inclusion of understudied factors (e.g., psychosocial and healthcare factors), there are limitations to note. All women in our sample were insured; therefore, findings are not generalizable to underinsured and uninsured women. Our sample was limited to women who initiated AET, so we cannot generalize findings to all women who are prescribed AET, particularly those who elect not to initiate therapy. The cross-sectional design of this study limited our ability to illustrate causation or to observe changes in women's beliefs over time.

### Clinical implications

Providers play a critical role in shaping women's beliefs about their AET medicines. An ideal approach to understanding patient beliefs about their medicines should involve tailored or individualized communication that affords patients with an opportunity to discuss how they feel about their medicines and any associated symptoms [42]. Given the differences in beliefs among women with varying education levels and household income, providers may consider offering additional resources or materials to these women with the goal to foster more positive beliefs about AET, which may ultimately improve adherence.

### Conclusion

Several sociodemographic and clinical characteristics, and healthcare and psychosocial factors were associated with women's necessity and concern beliefs about AET. Findings from this study offer educational and behavioral intervention targets for healthcare providers seeking to improve attitudes toward and adherence to AET. Future research should focus on exploring how healthcare factors, including patient-provider communication and patients' experiences with healthcare, impact perceptions and beliefs about medication and adherence to AET.

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### Compliance with ethical standards

**Conflict of interest** The authors declare that they have no conflict of interest.

### References

1. American Cancer Society (2019) Breast Cancer Facts & Figures, in American Cancer Society I (ed). Atlanta.
2. Alkner S, Bendahl PO, Ferno M, Nordenskjold B, Ryden L, South S, South-East Swedish Breast Cancer G (2009) Tamoxifen reduces the risk of contralateral breast cancer in premenopausal women: results from a controlled randomised trial. *Eur J Cancer* 45(14): 2496–2502. <https://doi.org/10.1016/j.ejca.2009.05.022>
3. Early Breast Cancer Trialists' Collaborative G, Davies C, Godwin J, Gray R, Clarke M, Cutter D, Darby S, McGale P, Pan HC, Taylor C, Wang YC, Dowsett M, Ingle J, Peto R (2011) Relevance of breast cancer hormone receptors and other factors to the efficacy of adjuvant tamoxifen: patient-level meta-analysis of randomised trials. *Lancet* 378(9793):771–784. [https://doi.org/10.1016/S0140-6736\(11\)60993-8](https://doi.org/10.1016/S0140-6736(11)60993-8)
4. Arimidex TAOiCTG, Forbes JF, Cuzick J, Buzdar A, Howell A, Tobias JS, Baum M (2008) Effect of anastrozole and tamoxifen as adjuvant treatment for early-stage breast cancer: 100-month analysis of the ATAC trial. *Lancet Oncol* 9(1):45–53
5. Early Breast Cancer Trialists' Collaborative Group E (2005) Effects of chemotherapy and hormonal therapy for early breast cancer on recurrence and 15-year survival: an overview of the randomised trials. *Lancet* 365(9472):1687–1717
6. Livaudais JC, Lacroix A, Chlebowski RT, Li CI, Habel LA, Simon MS, Thompson B, Erwin DO, Hubbell FA, Coronado GD (2013) Racial/ethnic differences in use and duration of adjuvant hormonal therapy for breast cancer in the women's health initiative. *Cancer Epidemiol Biomark Prev* 22(3):365–373. <https://doi.org/10.1158/1055-9965.Epi-12-1225>
7. Farias AJ, Du XL (2016) Ethnic differences in initiation and timing of adjuvant endocrine therapy among older women with hormone receptor-positive breast cancer enrolled in Medicare part D. *Med Oncol* 33(2):19-016-0732-0731. <https://doi.org/10.1007/s12032-016-0732-1>
8. Murphy CC, Bartholomew LK, Carpentier MY, Bluethmann SM, Vernon SW (2012) Adherence to adjuvant hormonal therapy among breast cancer survivors in clinical practice: a systematic review. *Breast Cancer Res Treat* 134(2):459–478. <https://doi.org/10.1007/s10549-012-2114-5>
9. Hershman DL, Kushi LH, Shao T, Buono D, Kershnerbaum A, Tsai WY, Fehrenbacher L, Gomez SL, Miles S, Neugut AI (2010) Early

- discontinuation and nonadherence to adjuvant hormonal therapy in a cohort of 8,769 early-stage breast cancer patients. *J Clin Oncol* 28(27):4120–4128. <https://doi.org/10.1200/JCO.2009.25.9655>
10. Hurtado-de-Mendoza A, Jensen RE, Jennings Y, Sheppard VB (2018) Understanding breast cancer survivors' beliefs and concerns about adjuvant hormonal therapy: promoting adherence. *J Cancer Educ* 33(2):436–439. <https://doi.org/10.1007/s13187-017-1180-0>
  11. Tan X, Camacho F, Marshall VD, Donohoe J, Anderson RT, Balkrishnan R (2017) Geographic disparities in adherence to adjuvant endocrine therapy in Appalachian women with breast cancer. *Res Social Adm Pharm* 13(4):796–810. <https://doi.org/10.1016/j.sapharm.2016.08.004>
  12. Hershman DL, Kushi LH, Hillyer GC, Coromilas E, Buono D, Lamerato L, Bovbjerg DH, Mandelblatt JS, Tsai WY, Zhong X, Jacobson JS, Wright JD, Neugut AI (2016) Psychosocial factors related to non-persistence with adjuvant endocrine therapy among women with breast cancer: the Breast Cancer Quality of Care Study (BQUAL). *Breast Cancer Res Treat* 157(1):133–143. <https://doi.org/10.1007/s10549-016-3788-x>
  13. Moon Z, Moss-Morris R, Hunter MS, Carlisle S, Hughes LD (2017) Barriers and facilitators of adjuvant hormone therapy adherence and persistence in women with breast cancer: a systematic review. *Patient Prefer Adherence* 11:305–322. <https://doi.org/10.2147/PPA.S126651>
  14. Qvarnstrom M, Kahan T, Kieler H, Brandt L, Hasselstrom J, Wettermark B (2019) Medication persistence to antihypertensive drug treatment - a cross-sectional study of attitudes towards hypertension and medication in persistent and non-persistent patients. *Blood Press* 1–8. <https://doi.org/10.1080/08037051.2019.1627858>
  15. Al-Noumani H, Wu JR, Barksdale D, Alkhasawneh E, Knafl G, Sherwood G (2017) Relationship between medication adherence and health beliefs among patients with hypertension in Oman: pilot study. *Sultan Qaboos Univ Med J* 17(3):e329–e333. <https://doi.org/10.18295/squmj.2017.17.03.012>
  16. Kadakia KC, Kidwell KM, Barton DL, Schott AF, Hayes DF, Griggs JJ, Henry NL (2019) Factors influencing the use of extended adjuvant endocrine therapy. *Breast Cancer Res Treat* 175:181–189. <https://doi.org/10.1007/s10549-019-05145-8>
  17. Thomeloe RJ, Home R, Side L, WolfMS, Smith SG (2019) Beliefs about medication and uptake of preventive therapy in women at increased risk of breast cancer: results from a multicenter prospective study. *Clin Breast Cancer* 19(1):e116–e126. <https://doi.org/10.1016/j.clbc.2018.10.008>
  18. Bright EE, Petrie KJ, Partridge AH, Stanton AL (2016) Barriers to and facilitative processes of endocrine therapy adherence among women with breast cancer. *Breast Cancer Res Treat* 158(2):243–251. <https://doi.org/10.1007/s10549-016-3871-3>
  19. Stanton AL, Petrie KJ, Partridge AH (2014) Contributors to nonadherence and nonpersistence with endocrine therapy in breast cancer survivors recruited from an online research registry. *Breast Cancer Res Treat* 145(2):525–534. <https://doi.org/10.1007/s10549-014-2961-3>
  20. Brett J, Fenlon D, Boulton M, Hulbert-Williams NJ, Walter FM, Donnelly P, Lavery B, Morgan A, Morris C, Watson E (2018) Factors associated with intentional and unintentional non-adherence to adjuvant endocrine therapy following breast cancer. *Eur J Cancer Care (Engl)* 27(1). <https://doi.org/10.1111/ecc.12601>
  21. Burstein HJ, Lacchetti C, Anderson H, Buchholz TA, Davidson NE, Gelmon KA, Giordano SH, Hudis CA, Solky AJ, Stearns V, Winer EP, Griggs JJ (2019) Adjuvant endocrine therapy for women with hormone receptor-positive breast cancer: ASCO clinical practice guideline focused update. *J Clin Oncol* 37(5):423–438. <https://doi.org/10.1200/jco.18.01160>
  22. Salgado TM, Davis EJ, Farris KB, Fawaz S, Batra P, Henry NL (2017) Identifying socio-demographic and clinical characteristics associated with medication beliefs about aromatase inhibitors among postmenopausal women with breast cancer. *Breast Cancer Res Treat* 163(2):311–319. <https://doi.org/10.1007/s10549-017-4177-9>
  23. Kumar K, Gordon C, Barry R, Shaw K, Horne R, Raza K (2011) It's like taking poison to kill poison but I have to get better': a qualitative study of beliefs about medicines in rheumatoid arthritis and systemic lupus erythematosus patients of South Asian origin. *Lupus* 20(8):837–844. <https://doi.org/10.1177/0961203311398512>
  24. Sheppard VB, Hurtado-de-Mendoza A, Zheng YL, Wang Y, Graves KD, Lobo T, Xu H, Jennings Y, Tolsma D, Trout M, Robinson BE, McKinnon B, Tadesse M (2018) Biospecimen donation among black and white breast cancer survivors: opportunities to promote precision medicine. *J Cancer Surviv* 12(1):74–81. <https://doi.org/10.1007/s11764-017-0646-8>
  25. Pellegrini I, Sarradon-Eck A, Ben Soussan P, Lacour AC, Largillier R, Tallet A, Tarpin C, Julian-Reynier C (2010) Women's perceptions and experience of adjuvant tamoxifen therapy account for their adherence: breast cancer patients' point of view. *Psychooncology* 19(5): 472479.
  26. Fallowfield LJ, Leaity SK, Howell A, Benson S, Cella D (1999) Assessment of quality of life in women undergoing hormonal therapy for breast cancer: validation of an endocrine symptom subscale for the FACT-B. *Breast Cancer Res Treat* 55(2):189–199
  27. Wolf MS, Chang CH, Davis T, Makoul G (2005) Development and validation of the communication and attitudinal self-efficacy scale for cancer (CASE-cancer). *Patient Educ Couns* 57(3):333–341
  28. Lukwago SN, Kreuter MW, Bucholtz DC, Holt CL, Clark EM (2001) Development and validation of brief scales to measure collectivism, religiosity, racial pride, and time orientation in urban African American women. *Fam Community Health* 24(3):63–71
  29. Bird ST, Bogart LM (2001) Perceived race-based and socioeconomic status (SES)-based discrimination in interactions with health care providers. *Ethn Dis* 11(3):554–563
  30. Sherbourne CD, Stewart AL (1991) The MOS social support survey. *Soc Sci Med* 32(6):705–714
  31. National comprehensive cancer network: NCCN clinical practice guidelines in oncology v. 2 (2008)
  32. Marshall G, Hays RD (1994) The patient satisfaction questionnaire short-form (PSQ-18), P-7865. Vol book, whole
  33. Makoul G (2003) The interplay between education and research about patient-provider communication. *Patient Educ Couns* 50(1): 79–84
  34. Safran DG, Kosinski M, Tarlov AR, Rogers WH, Taira DH, Lieberman N, Ware JE (1998) The primary care assessment survey: tests of data quality and measurement performance. *Med Care* 36(5):728–739
  35. LaVeist TA, Isaac LA, Williams KP (2009) Mistrust of health care organizations is associated with underutilization of health services. *Health Serv Res* 44(6):2093–2105. <https://doi.org/10.1111/j.1475-6773.2009.01017.x>
  36. Wuensch P, Hahne A, Haidinger R, Meissler K, Tenter B, Stoll C, Senf B, Huebner J (2015) Discontinuation and non-adherence to endocrine therapy in breast cancer patients: is lack of communication the decisive factor? *J Cancer Res Clin Oncol* 141(1):55–60. <https://doi.org/10.1007/s00432-014-1779-z>
  37. Kamal S, Bugnon O, Cavassini M, Schneider MP (2018) HIV-infected patients' beliefs about their chronic co-treatments in comparison with their combined antiretroviral therapy. *HIV Med* 19(1): 49–58. <https://doi.org/10.1111/hiv.12542>
  38. Brett J, Boulton M, Fenlon D, Hulbert-Williams NJ, Walter FM, Donnelly P, Lavery BA, Morgan A, Morris C, Watson EK (2018) Adjuvant endocrine therapy after breast cancer: a qualitative study of factors associated with adherence. *Patient Prefer Adherence* 12: 291–300. <https://doi.org/10.2147/ppa.S145784>
  39. Farias AJ, Omelas II, Hohl SD, Zeliadt SB, Hansen RN, Li CI, Thompson B (2017) Exploring the role of physician

- communication about adjuvant endocrine therapy among breast cancer patients on active treatment: a qualitative analysis. *Support Care Cancer* 25(1):75–83. <https://doi.org/10.1007/s00520-016-3389-6>
40. Badanta-Romero B, de Diego-Cordero R, Rivilla-Garcia E (2018) Influence of religious and spiritual elements on adherence to pharmacological treatment. *J Relig Health* 57(5):1905–1917. <https://doi.org/10.1007/s10943-018-0606-2>
41. Vyas KJ, Limneos J, Qin H, Mathews WC (2014) Assessing baseline religious practices and beliefs to predict adherence to highly active antiretroviral therapy among HIV-infected persons. *AIDS Care* 26(8):983–987. <https://doi.org/10.1080/09540121.2014.882486>
42. National Collaborating Centre for Primary Care (UK) (2009) *Medicines adherence: Involving patients in decisions about prescribed medicines and supporting adherence*. Royal College of General Practitioners (UK), London.

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