

# Psychosocial factors associated with adherence for self-management behaviors in women with breast cancer-related lymphedema

Jessica Alcorso<sup>1</sup> · Kerry A. Sherman<sup>1,2</sup> · Louise Koelmeyer<sup>3</sup> · Helen Mackie<sup>3</sup> · John Boyages<sup>3</sup>

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## Abstract

**Purpose** Cognitive and affective psychosocial factors have been found to underlie adherence to preventive behaviors in women at risk of developing lymphedema following treatment for breast cancer. The aim of this study was to determine if these factors are associated with adherence to self-management behaviors for women diagnosed with breast cancer-related lymphedema (BCRL).

**Methods** Women with BCRL were recruited through a community-based breast cancer organization and three Australian lymphedema treatment clinics. Participants completed an online questionnaire assessing demographics, medical history, adherence to self-management behaviors, psychosocial variables (personal control, treatment control, consequences, distress, and self-regulation of affect), and knowledge about lymphedema self-management.

**Results** A total of 166 women participated in the study. Participants reported adhering to a mean of five out of seven behaviors, with 19.5 % of participants adhering to all seven behaviors. Adherence to individual behaviors ranged from 65 % (self-lymphatic drainage) to 98.2 % (skin care). Greater knowledge about lymphedema was significantly correlated with higher adherence. Hierarchical multiple linear regression analysis indicated that only medical history factors (time since

diagnosis and having undergone hormone replacement therapy) predicted a significant amount of the variance in adherence.

**Conclusion** These findings highlight the importance of patient knowledge for optimal adherence to a self-management regimen. In addition, medical history factors may identify if a patient is at risk of nonadherence. The lack of association of adherence with other psychosocial factors considered in this study indicates that factors underlying adherence in affected women differ considerably from those factors prompting preventive behavior adherence in the at-risk population.

**Keywords** Breast cancer · Lymphedema · Patient adherence · Self-care · Psychosocial factors

Lymphedema is a chronic illness arising from a malfunction of the lymphatic system that causes a buildup of fluid in an area of the body, most often an arm or a leg [1]. Primary lymphedema is a congenital condition arising from developmental abnormalities [1], whereas secondary lymphedema results from external damage to the lymphatic system, typically from surgery and radiation therapy for cancer [2]. More than 20 % of women diagnosed with invasive breast cancer subsequently develop lymphedema in one or both arms [3]. Living with lymphedema can be physically disabling due to symptoms including swelling, pain, and functional impairment [4]. Lymphedema also impacts negatively on the affected individual from a psychosocial perspective, with impaired quality of life [5–7], body image disturbance [8, 9], and increased psychological distress [5, 8].

The effective self-management of breast cancer-related lymphedema (BCRL) involves numerous behaviors that require on-going enactment for minimizing symptoms and slowing illness progression [10], such as the following: (1)

✉ Jessica Alcorso  
jessica.alcorso@mq.edu.au

<sup>1</sup> Centre for Emotional Health, Department of Psychology, Macquarie University, Sydney, NSW 2109, Australia

<sup>2</sup> Westmead Breast Cancer Institute, Westmead Hospital, Sydney, Australia

<sup>3</sup> Macquarie University Cancer Institute, Macquarie University Hospital, Sydney, Australia

wearing a compression garment; (2) performing appropriate exercise type and intensity; (3) practicing good hygiene and skin care; (4) avoiding injury or trauma to the affected area; (5) elevating the affected area to reduce swelling; (6) performing self-lymphatic drainage (massage); and, (7) monitoring the affected area for changes in size, color, and/or temperature [11]. Adherence to lymphedema self-management is critical to avoid further progression of the illness and increased symptom severity [1], which may have negative impacts on an individual's financial (e.g., increased treatment costs) and emotional well-being and quality of life [8].

Despite the importance of lymphedema self-management behaviors, levels of adherence are suboptimal, varying from 28 % [12] to 69 % [13]. Variation between estimates is likely due to differences in specific self-management behaviors measured and how adherence was defined (e.g., the frequency with which a behavior is performed or the proportion of time a patient is adherent) [13, 14]. In order to understand why some individuals are adhering to their self-care and treatment guidelines when others are nonadherent, we need to consider factors (e.g., medical characteristics and beliefs about lymphedema) that may underlie the enactment of these behaviors. In particular, if improving treatment outcomes and relieving symptoms for patients are a priority, it is important to identify which patients are at risk of being poorly adherent in order to intervene early to maximize patient well-being.

Previous research on adherence in BCRL is limited but suggests that a range of psychosocial factors may influence adherence to lymphedema self-management behaviors. For example, psychological distress in women diagnosed with BCRL has been identified as a barrier to adherence [9]. Similarly, amongst women at risk of developing BCRL, a range of cognitive and affective factors are predictive of self-management adherence. In the at-risk group, lower levels of lymphedema-related distress and an increased ability to self-regulate this distress were related to greater adherence [15]. In addition, these women's beliefs in their self-efficacy to follow the recommendations, the controllability of lymphedema, and the negative consequences of lymphedema were predictive of greater adherence [19, 20]. Finally, greater knowledge of risk management behaviors is a strong predictor of adherence in women at risk of BCRL [15–17]. Knowledge has also been associated with adherence in other chronic conditions that, like lymphedema, involve self-management, such as coronary heart disease [18], diabetes [19], and asthma [20]. Considering the similarity between the recommendations provided to women who are at risk of BCRL and the affected population [12], it is likely that these psychosocial factors also underlie adherence to lymphedema self-management behaviors.

These findings are consistent with the views of a broad self-regulation perspective that an individual's behaviors in light of a health threat will be a function of their cognitive and affective representations of that illness [21, 22]. Within the

lymphedema context, this theoretical perspective predicts that for a woman diagnosed with this condition, her adherence to self-management behaviors will be a function of the specific beliefs that she holds about lymphedema (e.g., how effective the self-management behaviors are at controlling lymphedema, her personal ability to carry out the recommended behaviors, and perceived consequences of lymphedema) and her emotional representations (e.g., lymphedema-related distress and worry and her ability to manage any distress).

In sum, despite indications that lymphedema self-management is poorly adhered to, no systematic investigation of cognitive and affective factors and their association with adherence has been undertaken in women diagnosed with BCRL. The aims of this study were to determine whether cognitive and affective factors are associated with lymphedema self-management in individuals diagnosed with BCRL and, particularly, to investigate whether the factors associated with adherence for at-risk populations are also predictive of adherence in affected populations. On this basis, it was predicted that knowledge, self-efficacy, beliefs about the controllability and consequences of lymphedema and lymphedema-related distress, and self-regulatory ability to manage lymphedema-related distress would be associated with adherence.

## Method

### Participants and procedure

English-speaking adult (18+years) women who were previously diagnosed with BCRL were eligible to participate in the study. Following approval from the Macquarie University Human Ethics Review Committee, women were recruited through a community-based breast cancer organization, the Breast Cancer Network Australia, and three lymphedema treatment clinics located in Sydney, Australia. Respondents from the Breast Cancer Network Australia were recruited by email invitation to all breast cancer-affected members interested in research participation. Respondents from the lymphedema clinics were invited directly by clinic therapists who provided the women with an invitational letter that provided the web address to access the online questionnaire.

Participants completed one online questionnaire assessing demographic information, medical history, cognitive and affective factors, and adherence that was estimated to take 20 min to complete.

### Measures

**Demographics and medical history** Demographic information collected included age, Australian Aboriginal or Torres Strait Islander status, education level, income, marital status,

and employment status. Participants provided information about their medical history, including time since lymphedema diagnosis; the type of lymph node surgery that they underwent as part of their breast cancer treatment; and whether or not they received chemotherapy, radiation therapy, and/or hormone replacement therapy as part of their breast cancer treatment.

**Patient adherence** Seven self-management behaviors were chosen based on clinical guidelines [11]. Respondents nominated their specific therapist prescription for lymphedema self-management, as well as their self-reported adherence to these prescribed behaviors. Participants indicated the following: (1) how frequently they were advised to follow each self-management behavior (0=never, 7=daily) and (2) how frequently they currently perform each nominated behavior. To minimize possible bias in responses, the two sets of items were separated by the items assessing illness representations and on separate pages.

Level of adherence was calculated according to the algorithm: score 1 for each recommendation being adhered to at least as often as prescribed and, otherwise, zero. For example, if a participant reported being prescribed self-lymphatic drainage once a week, she was given a score of 1 (i.e., adherent) if she reported performing this behavior once a week or more. If she reported performing this behavior less than once a week, she was given a score of 0 (i.e., nonadherent).

Adherence was calculated for each behavior separately (i.e., a participant was scored as either adherent or nonadherent to each of the seven self-management behaviors) as well as a total sum adherence score out of seven (e.g., a score of 3 indicates that a participant is adherent to three out of the seven self-management behaviors). Each participant was given an adherence score out of seven, even if a woman reported being prescribed less than seven behaviors. For example, if a participant reported that her therapist had not prescribed wearing compression garments and she reported never wearing a garment, she was scored 1 as adherent for that behavior.

**Lymphedema-related cognitions** Beliefs about the controllability and consequences of lymphedema were measured using the personal control (six-item summed score;  $\alpha=0.72$ ), treatment control (five item summed score;  $\alpha=0.79$ ), and perceived consequence (six-item summed score;  $\alpha=0.88$ ) subscales of the Revised Illness Perception Questionnaire (IPQ-R) [23]. The IPQ-R has been validated in a wide range of patient populations, including cancer patients [24]. Items were revised such that “my illness” was replaced with “my lymphedema” (e.g., “My lymphedema is a serious condition”) to ensure that participants were answering with lymphedema in mind and not breast cancer. Each item is rated on a five-point scale (1=strongly disagree, 5=strongly agree). Self-

efficacy was assessed by a single five-point Likert-type item (“I believe that I have the ability to make the necessary lifestyle changes to carry out the recommended self-care practices to manage my lymphedema”) [15, 25].

**Lymphedema-related affect** Lymphedema-related distress was measured using the emotional representation subscale of the IPQ-R (e.g., “When I think about my lymphedema I get upset”) (six-item summed score;  $\alpha=0.84$ ). Self-regulation of negative affect associated with lymphedema was measured using two items [25] (1=strongly disagree, 5=strongly agree): (1) “I believe that I am able to calm myself down when anxious or worried about lymphedema” and “I believe that I am able to limit the amount of stress experienced as a result of lymphedema.” The scores on each item were added to create a sum score for self-regulation of affect ( $\alpha=0.81$ ).

**Knowledge** Knowledge regarding each self-management recommendation was assessed similar to previous lymphedema-related studies [17, 25] using the sum of seven counterbalanced true/false items (1=correct, 0=incorrect).

#### Data analysis

Descriptive statistics were calculated using SPSS<sup>®</sup>, version 21 for the demographic, medical history, and outcome (adherence) variables. Independent samples *t* tests and one-way ANOVAs (categorical variables) and Pearson (continuous variables), Spearman rank (ordinal variables), and point-biserial (dichotomous variables) correlations were undertaken to determine the level of association between the outcome variable (total adherence) and the demographic, medical history, and cognitive and affective variables to identify covariates. A priori calculation of minimum required sample size for multiple regression with seven predictor variables (cognitive and affective variables) was  $N=103$  for a medium effect size of 0.15 and 80 % power.

#### Results

A total of 200 individuals consented to participate in the study, and the final analyzable sample of  $n=166$  remained after removing incomplete data ( $n=34$ ). Sample characteristics are displayed in Table 1. The mean number of behaviors adhered to was 5.3 (SD=1.41) out of 7, with 19.5 % of participants adhering to all seven behaviors. Adherence to individual behaviors ranged from 65 % (performing self-lymphatic drainage) to 98.2 % (practicing good hygiene and skin care) (see Table 2 for descriptive statistics and paired comparisons between mean adherence levels to the self-management behaviors).

**Table 1** Characteristics of study participants (*n*=166)

Variable	Mean (SD) or %	Association with total adherence ( <i>p</i> value)
Age (years)	58.04 (10.62)	0.969
Australian Aboriginal or Torres Strait Islander (%)	2	0.482
Education (%)		0.457
High school or less	22.9	
Some university	38.6	
University degree or more	38.5	
Income (%)		0.068
Less than \$50,000	29.1	
\$50,000–\$100,000	40.4	
\$100,000–\$150,000	19.2	
More than \$150,000	11.3	
Marital status (%)		0.227
Married/partnered	79.9	
Divorced/separated	8.3	
Single	7.1	
Widowed	4.1	
Employment status (%)		0.831
Full time	30.8	
Part time	23.7	
Retired	35.5	
Unemployed	10	
Time since lymphedema diagnosis (years)	5.54 (5.49)	0.005*
Type of lymph node surgery (%)		0.562
Sentinel node	10.7	
Axillary	62.7	
I do not know	26.6	
Received chemotherapy (%)	79.9	0.056
Received radiation (%)	76.9	0.472
Received hormone replacement therapy (%)	29.6	0.014*

\*Correlation is significant at the 0.05 level (two-tailed)

Variables associated at *p*<0.10 with total adherence were entered into a hierarchical multivariate linear regression model to determine predictors of adherence. Of the demographic and

medical history variables, higher income (*r*=−0.15, *p*=0.068) and a longer time since lymphedema diagnosis (*r*=−0.22, *p*=0.005) were associated with lower levels of adherence, while

**Table 2** Paired samples *t* test comparisons between mean adherence levels to the individual self-management behaviors (*p* values)

Behavior	1	2	3	4	5	6	7	Adherent <i>n</i> (%)
1. Wear a compression garment.	–	0.682	0.001	0.001	0.190	0.999	0.015	118 (71.1)
2. Perform recommended exercise(s).		–	0.001	0.001	0.372	0.719	0.303	116 (69.9)
3. Practice good hygiene to keep skin and nails clean.			–	0.109	0.001	0.001	0.001	163 (98.2)
4. Actively avoid injury or infection to the affected area.				–	0.001	0.001	0.001	155 (93.4)
5. Perform self-lymphatic drainage (massage).					–	0.205	0.055	108 (65.0)
6. Elevate the affected area.						–	0.502	116 (69.9)
7. Monitor the affected area for changes in color, temperature, or size.							–	120 (71.0)

Due to the number of comparisons made, the critical alpha was reduced to *p*<0.01

**Table 3** Pearson correlations between the outcome (adherence) variable and psychosocial variables

	1	2	3	4	5	6	7	8	M	SD
1. Adherence		0.155	0.107	0.104	0.050	0.030	-0.154	0.193*	5.30	1.41
2. Personal control			0.266**	0.225**	-0.175*	-0.386**	-0.011	0.060	16.22	2.27
3. Treatment control				0.550**	-0.089	-0.197*	-0.275**	-0.012	16.16	3.32
4. Consequences					-0.158*	-0.291**	-0.023	0.024	15.43	3.27
5. Self-efficacy						0.300**	-0.182*	0.078	4.18	0.73
6. Self-regulation of affect							-0.008	-0.168*	7.69	1.41
7. Distress								-0.157*	15.25	1.95
8. Knowledge									5.51	1.14

\*Correlation is significant at the 0.05 level (two-tailed)

\*\*Correlation is significant at the 0.01 level (two-tailed)

having undergone chemotherapy ( $r=0.15$ ,  $p=0.056$ ) and hormone replacement therapy ( $r=0.20$ ,  $p=0.014$ ) was associated with higher levels of adherence. Pearson's correlations between adherence and the psychosocial variables are displayed in Table 3. Higher knowledge about lymphedema ( $r=0.19$ ,  $p=0.015$ ) and greater beliefs about the personal controllability of lymphedema ( $r=0.16$ ,  $p=0.051$ ) were associated with higher levels of adherence. Higher levels of lymphedema-related distress ( $r=-0.15$ ,  $p=0.052$ ) were associated with lower levels of adherence.

A hierarchical multiple linear regression analysis was conducted. The medical history variables associated with adherence (i.e., income, time since lymphedema diagnosis, chemotherapy, and hormone replacement therapy) were entered on the first step of the model, and the psychosocial predictors (i.e., knowledge, personal control, and distress) were entered on the second step. The overall model was statistically significant ( $R^2=0.16$  (16 %),  $F(7, 145)=4.03$ ,  $p<0.001$ ), with the

medical history variables accounting for approximately 11 % of the variance in the outcome (adherence) variable ( $R^2=0.11$ ). The  $F$  change for the addition of the psychosocial variables was statistically significant ( $F$  change=3.01,  $p=0.032$ ), and the psychosocial variables accounted for an additional 5 % of the variance. In the final model, the only variable significantly associated with reduced adherence was time since lymphedema diagnosis ( $t=-2.06$ ,  $p=0.042$ ) and, for increased adherence, hormone replacement therapy ( $t=2.41$ ,  $p=0.017$ ). A summary of the results of the regression analysis is shown in Table 4.

## Discussion

This study aimed to determine whether cognitive and affective factors are associated with lymphedema self-management in individuals diagnosed with BCRL and, particularly, whether

**Table 4** Hierarchical multiple linear regression analysis to determine factors associated with adherence to lymphedema self-management strategies

		Unstandardized coefficients		Standardized coefficients	$t$	$p$ value	95.0 % CI
		$B$	Std. error	Beta			
Step 1	Income	-0.16	0.09	-0.14	-1.78	0.077	(-0.35, 0.02)
	Time since diagnosis	-0.05	0.02	-0.21	-2.64	0.009	(-0.09, -0.01)
	Chemotherapy	0.39	0.27	0.11	1.43	0.154	(-0.15, 0.92)
	Hormone replacement therapy	0.50	0.20	0.19	2.47	0.015	(0.10, 0.89)
Step 2	Income	-0.14	0.09	-1.2	-1.55	0.123	(-0.33, 0.04)
	Time since diagnosis	-0.04	0.02	-0.17	-2.06	0.042	(-0.08, -0.01)
	Chemotherapy	0.53	0.27	0.15	1.97	0.051	(-0.01, 1.06)
	Hormone replacement therapy	0.49	0.20	0.19	2.41	0.017	(0.09, 0.89)
	Knowledge	0.15	0.10	0.12	1.51	0.132	(-0.04, 0.34)
	Personal control	0.08	0.05	0.13	1.70	0.092	(-0.01, 0.18)
	Distress	-0.09	0.06	-0.13	-1.67	0.098	(-0.20, 0.02)

$R^2=0.07$  for step 1;  $\Delta R^2=0.05$ ,  $p=0.037$  for step 2

CI confidence interval

the factors associated with adherence for at-risk populations are also predictive of adherence in affected populations. Adopting a broad self-regulation framework [21, 22] and guided by previous research on the at-risk population [15–17, 25], it was predicted that knowledge, self-efficacy, beliefs about the controllability and consequences of lymphedema and lymphedema-related distress, and self-regulatory ability to manage lymphedema-related distress would be associated with adherence. Overall, women in this study reported adhering to a mean of five out of seven self-management behaviors; however, only 19.5 % of women reported adhering to all seven behaviors (i.e., 100 % adherent). Two previous studies reported levels of adherence similar to this study [13, 14], whereas others have found lower levels of adherence (<30 %) [12, 26]. Inconsistent findings may be a result of differences in how adherence was measured and defined. This study addressed some of the limitations of earlier work [12, 14, 26] investigating adherence to lymphedema self-management by calculating a total adherence score tailored to each woman's specific self-management prescription. Measuring adherence as a direct function of the prescribed behaviors provides a more accurate estimation of adherence in these populations. Inconsistent findings from previous studies might also be explained by the finding that levels of adherence vary amongst the individual self-management behaviors. For example, in this study, adherence to self-lymphatic massage and compression garment use was relatively low, consistent with previous research [12, 13, 26]. In comparison, adherence to skin hygiene and avoiding injury was significantly greater than all other behaviors. This finding is also similar to previous research with both the affected [13, 14] and at-risk [15, 17] populations. Skin care, such as applying moisturizer, is a commonly undertaken daily behavior for women generally and, therefore, is likely to have been part of the participants' regular routine prior to developing lymphedema [17]. However, for other behaviors such as compression garment use and self-lymphatic drainage, the women would have had to learn new skills as well as be able to incorporate this new behavior into their daily or weekly routine. Compression garment use is one of the more challenging ongoing self-management strategies [12, 13, 26], and the relatively low level of adherence reported in this study is consistent with this view.

The results of this study suggest that medical history variables are important for understanding adherence to lymphedema self-management. Time since diagnosis and hormone replacement therapy use both explained a significant portion of the variance in adherence in the regression model. These findings are in contrast to a previous study that found no relationship between demographic and medical history variables and adherence to a home-based lymphedema treatment system [27]. However, it is plausible that patients are initially more enthusiastic about, and committed to, their self-management but become less adherent over time as they face barriers to

following their regime (e.g., a lack of time). Furthermore, a recent study [28] found that adherence to health checks (e.g., mammograms) was associated with hormone replacement therapy use.

Regarding our hypothesis, the multivariate analyses provided limited support for the self-regulation perspective that a range of cognitive and affective variables would be associated with self-management adherence [21, 22]. Although greater knowledge about lymphedema self-management was significantly correlated with higher levels of adherence, it was not a significant predictor of adherence in the regression model. Similarly, beliefs about the personal controllability of lymphedema and lymphedema-related distress were included in the model but did not predict a significant amount of the variance.

That knowledge was significantly associated with adherence is consistent with findings from both the at-risk population and other chronic disease populations. Knowledge about lymphedema [16, 17, 25] and information provision [29] is associated with adherence to lymphedema preventive behaviors in the at-risk population. For chronic disease management more generally, knowledge is associated with adherence to lifestyle changes for individuals living with coronary heart disease [18] and the self-management of diabetes [19]. Collectively, these findings support the critical importance of a patient having adequate knowledge about his or her illness and self-management for optimal adherence. Thus, lymphedema therapists and other practitioners should aim to assess patients' level of knowledge about lymphedema at initial diagnostic assessment and provide adequate information and resources, such as access to relevant websites.

This study's findings have implications for the self-regulation perspective used as a framework for this research [21, 22]. Although the findings from the at-risk population are in support of these theories, it may be that cognitive and affective factors are not as significant for understanding adherence in populations affected by chronic disease. For example, a meta-analysis found that the cognitive and affective illness representations are poor predictors of adherence for individuals with chronic diseases, such as asthma, diabetes, and hypertension [30]. Similarly, a systematic review found that only belief about the controllability of illness is associated with adherence to self-management in children and young adults with chronic disease [31]. Perhaps, self-regulatory models are more effective at predicting individuals' responses to health threats in comparison to predicting adherence to disease self-management.

That the cognitive and affective variables were not significant predictors of adherence in this study is inconsistent with previous findings from the at-risk population. This suggests that different processes impact on the at risk compared to the affected groups and that women with breast cancer at risk of developing lymphedema may not be an informative

comparison group for understanding adherence to lymphedema self-management behaviors, despite the similarity between recommendations provided to both groups and their similar medical histories. It may be that the threat of developing an illness motivated adherence differently to the reality of living with, and self-managing, a chronic disease; however, to the best of our knowledge, no other study has compared a population at risk of developing a disease and a population diagnosed with the disease on factors underlying patient adherence.

For future research in the lymphedema context, it may be more informative to look at other chronic illnesses that involve self-management regimes instead of the at-risk population. For example, diabetes may be a useful comparator for the lymphedema context as the diabetes self-care regimen is similar to lymphedema self-care in a number of ways, including skin care, exercise, and compression garment use [19, 32]. Another potential line of investigation is to determine if the barriers reported by individuals living with lymphedema are actual predictors of adherence. Previous research has identified a number of reported barriers including the financial cost of treatment [9, 33], physical limitations and/or symptoms [9, 33, 34], time management [9, 35], social isolation [33], and psychological distress [34]. These barriers are similar to those reported by individuals living with other chronic illnesses that require on-going self-management, such as diabetes, asthma, and arthritis [36].

When interpreting the findings of this study, some possible limitations need to be considered. First, the data were obtained from self-report only, and there was no objective measure of lymphedema diagnosis nor stage or severity. To overcome this limitation, indicators of lymphedema status were included, such as number of symptoms and time since diagnosis. Second, data were collected using an online survey and participants were recruited from a community-based breast cancer organization. Participants in this sample are well educated, with a higher proportion of participants in this sample having attained the equivalent of a Bachelor degree or higher (38 %) in comparison to the average for Australian women (27 %) [37]. This sample may also be more actively concerned about their health than other women in the target population. Finally, it is possible that we did not find significant associations between psychosocial variables and adherence due to methodological limitations in how the variables were measured. For example, self-efficacy has been found to be a key factor associated with adherence not only amongst women at risk of developing BCRL [15, 25], but also more broadly when looking at medication compliance [38], adherence to lifestyle changes (e.g., exercise) [39], and adherence to self-management (e.g., diabetes) [40]. The item used to measure self-efficacy in this study was used in previous studies with the at-risk population [15, 25], but perhaps, it was not sensitive enough to capture a relationship between self-efficacy and lymphedema self-management.

In conclusion, this study found that adherence to BCRL self-management is not optimal, with only approximately one in five women reporting 100 % adherence to their self-management regime. The findings of this study suggest that medical characteristics are important for identifying women who are at risk of nonadherence. Furthermore, knowledge about lymphedema self-management is associated with adherence, and so, lymphedema therapists should aim to assess knowledge at initial diagnostic assessment. Finally, the psychosocial factors associated with adherence in women at risk of BCRL as identified in previous research were not found to be significantly associated with adherence in women diagnosed with BCRL in this study.

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**Conflict of interest** The authors have full control over primary data and allow the journal to review this primary data if requested. The authors would like to report no conflict of interest.

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