

RESEARCH ARTICLE (ORIGINAL) 

## Quality of life assessment of women after a post-breast surgery rehabilitation program

*Avaliação da qualidade de vida da mulher com cirurgia da mama após programa de reabilitação*

*Evaluación de la calidad de vida de las mujeres con cirugía mamaria después del programa de rehabilitación*

Tânia Marisa Pinto Rodrigues<sup>1,2,3</sup>

 <https://orcid.org/0000-0003-4785-3783>

Bárbara Pereira Gomes<sup>4</sup>

 <https://orcid.org/0000-0001-9312-8051>

<sup>1</sup> Institute of Biomedical Sciences Abel Salazar, Porto, Portugal

<sup>2</sup> Santa Maria Health School, Porto, Portugal

<sup>3</sup> São João University Hospital Center, Porto, Portugal

<sup>4</sup> Nursing School of Porto, Porto, Portugal

### Abstract

**Background:** Early breast cancer diagnosis and therapeutic advances have contributed to increasing survivorship, yet little is known about how women's quality of life (QoL) is affected.

**Objective:** To evaluate the QoL of women who underwent breast surgery with axillary lymph node dissection after a rehabilitation program was implemented.

**Methodology:** Quantitative pre- and post-intervention assessment study involving 48 women recruited from a Hospital Center between 2018 and 2019. A three-month rehabilitation program was implemented in the participants' homes. The instruments used were EORTC-QLQ-C30 and BR23.

**Results:** After the program implementation, the participants' QoL improved in functional aspects (role, emotional, cognitive, social, body image, future perspectives) and symptoms (fatigue, pain, insomnia, systemic therapy side effects, and breast and arm symptoms).

**Conclusion:** This program has positively influenced the participants' QoL, providing them with the knowledge and skills to take an active and informed part in their motor rehabilitation.

**Keywords:** quality of life; breast cancer; rehabilitation nursing; rehabilitation programs; breast surgery; axillary lymph node dissection

### Resumo

**Enquadramento:** O diagnóstico precoce do cancro da mama e os avanços terapêuticos têm contribuído para um aumento de sobreviventes, contudo, pouco se sabe de que forma a qualidade de vida das mulheres é afectada.

**Objetivo:** Avaliar a qualidade de vida da mulher submetida a cirurgia da mama com esvaziamento ganglionar axilar após implementação de um programa de reabilitação.

**Metodologia:** Estudo quantitativo de avaliação pré e pós intervenção, a 48 mulheres, recrutadas num Centro Hospitalar entre 2018 e 2019. Implementou-se um programa de reabilitação durante 3 meses no domicílio das participantes. Os instrumentos utilizados foram EORTC-QLQ-C30 e BR23.

**Resultados:** Após implementação do programa, a qualidade de vida das participantes, melhorou nos aspetos funcionais (desempenho, emocional, cognitiva, social, imagem corporal, perspetiva futura) e sintomas (fadiga, dor, insónia, efeitos terapia sistémica, da mama e braço).

**Conclusão:** Este programa influenciou positivamente a qualidade de vida das participantes, tendo-lhes fornecido o conhecimento e as competências para terem uma participação ativa e informada na sua reabilitação motora.

**Palavras chave:** qualidade de vida; neoplasias da mama; enfermagem em reabilitação; programas de reabilitação; mastectomia; esvaziamento ganglionar axilar

### Resumen

**Marco contextual:** El diagnóstico precoz del cáncer de mama y los avances terapéuticos han contribuido a aumentar el número de supervivientes; sin embargo, se sabe poco sobre cómo afecta la calidad de vida de las mujeres.

**Objetivo:** Evaluar la calidad de vida de las mujeres sometidas a una cirugía mamaria con extirpación de los ganglios linfáticos axilares tras la implementación de un programa de rehabilitación.

**Metodología:** Estudio cuantitativo de evaluación pre y posintervención a 48 mujeres captadas en un centro hospitalario entre 2018 y 2019. Se implementó un programa de rehabilitación durante 3 meses en los hogares de las participantes. Los instrumentos utilizados fueron EORTC-QLQ-C30 y BR23.

**Resultados:** Tras la implementación del programa, la calidad de vida de las participantes mejoró en los aspectos funcionales (desempeño, emocional, cognitivo, social, imagen corporal, perspectiva de futuro) y en los síntomas (fatiga, dolor, insomnio, efectos de la terapia sistémica, de mama y brazo).

**Conclusión:** Este programa influyó positivamente en la calidad de vida de las participantes, proporcionándoles los conocimientos y las competencias necesarias para participar activamente y con conocimiento de causa en su rehabilitación motora.

**Palabras clave:** calidad de vida; cáncer de mama; rehabilitación de enfermería; programas de rehabilitación; cirugía de mama; vaciamiento ganglionar axilar

### Corresponding author

Tânia Marisa Pinto Rodrigues

E-mail: [tmarisaprodriues@gmail.com](mailto:tmarisaprodriues@gmail.com)

Received: 22.01.21

Accepted: 01.09.21



**How to cite this article:** Rodrigues, T. M., & Gomes, B. P. (2021). Woman's life quality evaluation with breast surgery after rehabilitation program. *Revista de Enfermagem Referência*, 5(Supl. 8), e21013. <https://doi.org/10.12707/RV21013>



## Introduction

Breast cancer is the leading cancer among women in all European countries and the main cause of women's death in Europe (Ferlay et al., 2018).

In Portugal, breast cancer is the most common cancer among women, being the 2<sup>nd</sup> type of cancer with the highest incidence (11.6%) and the 5<sup>th</sup> most deadly (6.2%). The incidence rate of breast cancer in women in 2020 was 26.4% and was responsible for the death of 1,864 women (The Global Cancer Observatory, 2021).

The early diagnosis and the gradual evolution of treatments and access to care have increased the survivorship rate of women with breast cancer. However, it is still not possible to prevent the onset of complications such as changes in arm mobility, pain, lymphedema, fatigue, depression, and decreased quality of life (QoL; Olsson Möller et al., 2019). Women's breast cancer is a current issue because of its high incidence rate, prevalence, and increase in survivorship. Despite this, little is known about how these women's QoL is affected by this clinical situation and its treatments. Thus, assessing QoL in its different dimensions is one of the relevant areas of this study. Health-related QoL includes the women's perspectives on health considering the symptoms caused by the disease and/or treatment and the physical, psychological, social, family, work, and economic functions. Hence, this study aims to assess the QoL of women who underwent breast surgery with axillary lymph node dissection (ALND) after a rehabilitation program was implemented.

## Background

Except for East Africa, breast cancer is the most frequently diagnosed cancer in women worldwide. Moreover, in 11 regions of the world, it is the most frequent cause of death from cancer (Ferlay et al., 2019).

According to the Directorate General of Health (Direção-Geral da Saúde, 2017), cancer diseases are the 2<sup>nd</sup> leading cause of death in Portugal and the one with the highest increase in recent years. By 2040, according to The Global Cancer Observatory (2020), the number of new cases of breast cancer in Portugal is estimated to reach 7,100 women, an increase of 0.8% compared to 2020. Parallel to the increase in therapeutic advances, the number of breast cancer survivors who may face several physical and psychological issues has also increased (Ergun et al., 2013). Breast surgery is one of the most commonly used treatments for breast cancer. When coupled with ALND, women have a higher risk of developing arm and shoulder impairments, reduced range of motion and muscle strength, pain, lymphedema, and difficulty in performing activities of daily living (Hidding et al., 2014). These women have impaired ipsilateral limb functioning, increasing the incidence of chronic morbidity and limiting their ability to perform activities of daily living, thus affecting their professional and social life and consequently decreasing their QoL (Zabit & Iyigun, 2019). Rehabilitation can help breast cancer survivors achieve and

maintain the best possible physical, social, psychological, and vocational functions. Shoulder and scapular mobility exercises and stretches improve upper limb muscle activation and shoulder range of motion and decrease chest pressure and pain (Paolucci et al., 2021).

Several primary studies and systematic reviews (Cheng et al., 2017; Ergun et al., 2013; Olsson Möller et al., 2019) have assessed the effects of exercise on women's QoL after breast cancer treatment and demonstrated that exercise improves QoL.

## Research question

Is there an association between implementing a rehabilitation program for women who underwent breast surgery with ALND and self-reported QoL assessment?

## Methodology

This is a quantitative study of pre- and post-intervention assessment. It was implemented for 3 months, under the researcher's supervision (Nurse Specialist in Rehabilitation Nursing), who visited each participant's home once a week. Data were collected between February 2018 and June 2019. The choice of not including a control group was because there were not enough participants meeting the defined criteria.

The sample size was calculated with the G+ Power 3.3.9.2 software, using the t-test for paired samples as reference. The result suggested a sample size of 45 participants, which, when compared to other studies, demonstrated that this sample size was sufficient. A convenience sample was then composed of 48 women who underwent breast surgery and were discharged from the breast center nursing consultation at a hospital institution. All participants met the inclusion criteria for the study, namely being a woman who underwent breast surgery with ALND, had healed surgical wounds, was over 18 years of age with decision-making ability, had no osteoarticular problems before the surgery and never attended a rehabilitation program. A self-completed questionnaire was prepared to collect socio-demographic data. The self-completion EORTC QLQ-C30 and EORTC QLQ-BR23 questionnaires were used to collect data on QoL.

Translated and validated for the Portuguese population by Pais-Ribeiro et al. (2008), the EORTC QLQ-C30 assesses the health-related QoL of individuals with cancer disease. It is composed of five functional scales (physical, emotional, cognitive, social, and role functioning), three symptom scales (fatigue, pain, nausea, and vomiting), a global assessment scale (health and QoL), and six single items that assess cancer disease symptoms (dyspnea, loss of appetite, sleep disturbance, constipation, diarrhea, and financial difficulties) during the disease and treatment, with a total of 30 questions (EORTC, 2001). Responses are in a Likert-type format, set on a scale of 1 to 4 (1- *not at all*, 2- *a little*, 3- *quite a bit*, and 4- *very much*) for the functional and symptomatic scales and on a scale of 1 to

7 (1- *very poor* and 7- *excellent*) for the global health scale (questions 29 and 30). The scores for the scales and items are calculated using a formula provided in the specific EORTC QLQ-C30 manual.

The EORTC QLQ-BR23, a supplementary questionnaire to the EORTC QLQ-C30, is specific to breast cancer during the disease process and treatments. It consists of two scales and has 23 items. The first scale consists of four functional subscales that assess the patient's physical functioning during and after cancer diagnosis and treatment. The second scale also consists of four symptom subscales, assessing the patient-reported disease symptoms and treatment side effects. The functional subscales include body image, sexual functioning, sexual enjoyment, and future perspectives; the symptom subscales include systemic therapy side effects, breast symptoms, arm symptoms, and hair loss concerns (EORTC, 2001).

As with the EORTC QLQ-C30, the responses are in a Likert-type format with a scale from 1 to 4 (1- *not at all*, 2- *a little*, 3- *quite a bit*, and 4- *very much*), whose value for the scales ranges from 0 to 100. A high score on the functional scales corresponds to a better level of functioning and better QoL. In comparison, a high score on the symptomatic scales indicates a higher level of symptomatology and worse QoL. This questionnaire has only one translation into Portuguese, which the EORTC provides. The authors authorized the use of the scales. This study obtained a favorable opinion from the Institution's Board of Directors and Ethics Committee (Opinion 298/17). The women's participation was voluntary, their consent was preceded by information about the study's scope, and the confidentiality of the data was guaranteed, complying with all ethical and legal principles.

After the researcher contacted them by telephone, the participants were recruited at their homes. The program was explained at the participants' homes, and the following questionnaires were applied: the socio-demographic self-completed questionnaire, the EORTC QLQ-C30, and EORTC QLQ-BR23. After answering the questionnaires, a health education session was held on lymphedema risk reduction measures, cervical spine and ipsilateral limb mobility exercises (a flyer with photos of the exercises was provided), arm massage, and scar massage.

The program was developed in several steps. First, a li-

terature review was conducted in different sources of information (databases, repositories, and aggregation systems). The rehabilitation nursing program was designed based on the evidence collected, including cervical spine and shoulder mobility exercises in different planes of motion, ipsilateral upper limb massage, and scar massage. A group of experts was later created to review and validate this program.

The data collected were analyzed using the IBM SPSS® Statistics software, version 25.0 for Windows. Descriptive statistics were used to characterize the sample and calculate the mean values of each instrument, considering the two moments of assessment. The comparison between the scores of the EORTC questionnaires at both moments was performed through the Wilcoxon test for paired samples, as the women were the same at both moments.

## Results

The results show that the participants' mean age is 49.2 years, ranging between a minimum of 28 and a maximum of 79. Regarding the type of breast surgery with ALND, the most frequent was the modified radical mastectomy (47.9%), followed by the tumorectomy (37.5%), the total mastectomy (12.5%), and the radical mastectomy (2.1%). The participants' qualifications ranged from none (one) to the post-doctoral degree (one). Other qualifications whose scores stood out were the 9<sup>th</sup> grade (22.9%), the bachelor's degree (18.8%), the 12<sup>th</sup> grade (16.7%), the 6<sup>th</sup> grade (14.6%), and the 4<sup>th</sup> grade (8.3%).

Most of the participants were married (56.3%), 18.8% were single, 14.6% were divorced, 6.3% were in a non-marital partnership, and 4.2% were widowed.

Among the participants, there were 29 different occupations, from which stood out 18.8% of unemployed, 10.4% of seamstresses, 8.3% of housewives, 8.3% of pensioners, and 4.2% of operational assistants.

The results presented in Tables 1 and 2 refer to the changes in QoL before and after the rehabilitation program for each domain of the EORTC QLQ-C30 and BR23 instruments. The scores of these sub-scales at both moments were compared using the Wilcoxon test (W) for paired samples, and the p-value of the test is also indicated in the table (significance level of 5%).

**Table 1***Inferential statistics: changes in QoL values - EORTC QLQ-C30 Scale*

	<b>Before M (SD)</b>	<b>After M (SD)</b>	<b>p</b>	<b>W</b>
<b>EORTC QLQ-C30: Global health status</b>				
Quality of Life	46.9 (23.0)	79.5 (19.7)	< 0.001	40.5
<b>EORTC QLQ-C30: Functional Scales</b>				
Physical functioning	65.7 (23.9)	89.0 (11.9)	< 0.001	24.5
Role functioning	37.9 (28.7)	93.4 (12.7)	< 0.001	0
Emotional functioning	60.9 (24.1)	83.0 (23.5)	< 0.001	112
Cognitive functioning	73.6 (26.4)	82.3 (19.9)	0.002	70.5
Social functioning	53.1 (36.3)	95.5 (13.6)	< 0.001	0
<b>EORTC QLQ C30: Symptoms</b>				
Fatigue	39.6 (28.3)	22.5 (18.1)	< 0.001	605
Nausea and vomiting	3.9 (9.3)	5.2 (14.2)	0.641	35
Pain	53.1 (28.9)	8.3 (14.2)	< 0.001	1027.5
Dyspnea	5.6 (14.3)	5.6 (14.3)	0.514	52.5
Insomnia	45.8 (34.8)	23.6 (30.7)	< 0.001	451
Appetite loss	11.8 (23.3)	12.5 (24.4)	0.427	64
Constipation	18.8 (33.6)	16.7 (24.8)	0.393	123.5
Diarrhea	11.8 (24.3)	11.8 (23.3)	0.489	69
Financial difficulties	42.4 (37.5)	20.8 (28.0)	< 0.001	409

*Note.* M = Mean; SD =Standard Deviation.**Table 2***Inferential statistics: changes in QoL values – EORTC BR23 Scale*

	<b>Before M (SD)</b>	<b>After M (SD)</b>	<b>p</b>	<b>W</b>
<b>EORTC BR23: Functional Scales</b>				
Body image	70.1 (29.5)	84.9 (23.9)	< 0.001	87.5
Sexual functioning	17.0 (21.3)	18.4 (20.4)	0.226	93.5
Sexual enjoyment	50.8 (27.1)	47.6 (29.0)	0.445	6.5
Future perspectives	29.2 (32.0)	38.2 (37.7)	0.025	108
<b>EORTC BR23: Symptom scales</b>				
Systemic therapy side effects	22.4 (17.9)	17.4 (15.1)	0.012	604
Breast symptoms	25.4 (20.1)	12.2 (15.3)	< 0.001	808
Arm symptoms	47.7 (17.4)	7.9 (10.2)	< 0.001	1128
Upset by hair loss				

*Note.* M = Mean; SD =Standard Deviation.

The values presented refer to scores between 0 and 100. As Table 1 shows, the scores of the general health scale had a sharp increase after the program, thus leading to the conclusion that, on average, the general health sta-

tus improved. The same is true for the scales of physical functioning, role functioning, emotional functioning, social functioning, and body image ( $p < 0.001$ ). The cognitive functioning ( $p = 0.002$ ) and future perspectives

( $p = 0.025$ ) scales also increased their scores significantly after the program. This is relevant as it demonstrates that the average level of functioning became healthier, i.e., improved.

It is important to note that, in the functioning scales, the increase in scores suggests improvement, while in the symptom scales, the opposite is true, i.e., the decrease in scores after the program reveals that the average level of symptoms decreased. The symptom scales of fatigue, pain, insomnia, financial difficulties, breast symptoms, and arm symptoms registered lower scores after the program ( $p < 0.001$ ), thus indicating that the average level of symptoms decreased, i.e., the health status improved. The same was true for systemic therapy side effects ( $p = 0.012$ ).

Regarding the symptoms of nausea and vomiting, dyspnea, loss of appetite, constipation, and diarrhea, there are very few differences between the scores before and after the program, which is not significant, so it is considered that the mean level of symptomatology did not change, remaining very low in both moments.

The same can be applied to the functional subscales of sexual enjoyment and sexual functioning, in which there are few differences between the scores before and after the program. Sexual enjoyment presents a p-value of 0.445 and sexual functioning a p-value of 0.226, which is not significant. Thus, it is assumed that, on average, these two functional subscales did not change, being very low in both moments. Regarding the concern with hair loss, there are only four answers to this question, three of them equal to 0 (the minimum of the scale) and one equal to 33.3. In both moments, the number of answers is very low, which means that very few women had hair loss, and almost none were worried about hair loss. Therefore, it is not possible to compare the two moments due to the very low number of answers.

## Discussion

The sample's age range was between 28 and 79 years, which aligns with the literature that breast cancer occurs both in younger and older women in Portugal (Forjaz de Lacerda et al., 2018). In this study, the most frequent surgical intervention was mastectomy. This result agrees with Dragun et al. (2012), who report that mastectomy is increasing in all age groups, particularly in women <50 years and  $\geq 70$  years. This increase may be associated with several factors, such as patient preference for mastectomy in younger populations with higher lifetime risk due to fear of genetic or recurrence risk and intangible factors (McGuire et al., 2009), women's desire for symmetry, perception of decreased risk of future cancer and improved QoL (Lovelace et al., 2019), and advanced tumor stage at the time of diagnosis (Al-Gaithy et al., 2019).

Women are increasingly surviving breast cancer regardless of their chosen treatment, but around 90% experience unexpected long-term sequelae due to treatment, such as physical, functional, emotional, and psychosocial changes that can dramatically alter breast cancer survivors' QoL (Lovelace et al., 2019). For cancer survivors, the aim is

to maximize their physical and psychosocial well-being and improve QoL for a successful transition to normal life patterns (Cheng et al., 2017). Thus, it is important to implement a Rehabilitation Nursing program for these women. Evidence has emerged over the years that breast cancer rehabilitation can help survivors achieve and maintain optimal physical, social, psychological, and vocational functioning (Paolucci et al., 2021). In 2017, Cheng et al.'s systematic review with meta-analysis observed that multidimensional home-based survivorship programs provide a short-term beneficial effect, improve QoL and some of its domains, and may reduce fatigue and insomnia. The study also concluded that group-based interventions improve physical, emotional, and functional QoL. However, Cheng et al. also observed that these programs do not seem to have beneficial effects three months after the intervention. This is contrary to this study that, after three months of individual rehabilitation at home, observed significant improvements in the scores of global QoL, functional scales (physical, emotional, cognitive, social, role, body image, and future perspectives), and symptom scales (fatigue, pain, insomnia, financial difficulties, systemic therapy side effects, breast symptoms, and arm symptoms).

Reinforcing this study's results, Olsson Möller et al.'s (2019) systematic review described that exercise interventions improved outcomes such as shoulder range of motion, lymphedema, pain, fatigue, and QoL.

In addition to the dimensions above, it is known that breast cancer treatment can affect sexuality (Albers et al., 2020). However, this was not observed by this study, as there were no changes in both sexual functioning and sexual enjoyment reported before or after the program, perhaps because women survivors are often reluctant to express their needs (Ghizzani et al., 2018). This study reinforces the importance of an intervention program aimed at women who underwent breast surgery to improve the functioning and symptoms of the ipsilateral upper limb and, ultimately, their QoL.

None of our participants experienced side effects or developed lymphedema during this study.

This study's limitations may include the sample size and the inclusion of participants in different treatment stages (surgery, radiation therapy, chemotherapy).

This study has risks of bias due to not having a control group.

## Conclusion

Although more and more women survive breast cancer, little is known about how their QoL is affected by this clinical situation and its treatments.

Following its objective, this study provided new evidence on the QoL of women who underwent breast surgery with ALND after a rehabilitation nursing program, particularly regarding dimensions of functioning and symptoms. This program provided women with the knowledge and skills to actively participate in their recovery, ensuring the long-term continuity of the rehabilitation program.

This study's outcomes point to a program consistent in its educational, motor, and physical components that improves its participants' QoL.

A further important aspect is that this program is carried out at the women's home, thus avoiding the frequent trips to the hospital. From the women's perspective, repeated trips to the hospital have both time and cost implications, bringing associated discomfort and significant financial impact.

This rehabilitation program with educational and physical components and massage of the scar and ipsilateral upper limb delivered at the participants' homes provides evidence that exercise can be beneficial/effective in improving women's QoL after breast cancer treatments.

This study's major implication for care practice is to continue monitoring the results of this rehabilitation program, providing information and adequate responses to these women's needs regarding their functioning and symptoms, thus improving their QoL.

From a theoretical point of view, it is crucial to provide rehabilitation nurses with more in-depth knowledge and skills on the issues these women face while recovering the ability to effectively perform their daily living activities. The suggestion for further research is to conduct more studies to demonstrate the benefits of exercise in these women's QoL, namely the impact of rehabilitation on the relationship between the type of surgical approach and QoL, using control groups.

#### Author contributions

Conceptualization: Rodrigues, T. M., Gomes, B. P.

Data curation: Rodrigues, T. M., Gomes, B. P.

Formal analysis: Rodrigues, T. M., G Gomes, B. P.

Methodology: Rodrigues, T. M., Gomes, B. P.

Investigation: Rodrigues, T. M., Gomes, B. P.

Supervision: Rodrigues, T. M., Gomes, B. P.

Writing – original draft: Rodrigues, T. M., Gomes, B. P.

Writing – review & editing: Rodrigues, T. M., Gomes, B. P.

#### References

- Al-Gaithy, Z. K., Yaghmoor, B. E., Koumu, M. I., Alshehri, K. A., Saqah, A. A., & Alshehri, H. Z. (2019). Trends of mastectomy and breast-conserving surgery and related factors in female breast cancer patients treated at King Abdulaziz University Hospital, Jeddah, Saudi Arabia, 2009-2017: A retrospective cohort study. *Annals of Medicine and Surgery*, *41*, 47-52. <https://doi.org/10.1016/j.amsu.2019.03.012>
- Albers, L. F., Van Ek, G. F., Krouwel, E. M., Oosterkamp-Borgelink, C. M., Liefers, G. J., Den Ouden, M. E., Den Oudsten, B. L., Krol-Warmerdam, E. E., Guicherit, O. R., Linthorst-Niers, E., Putter, H., Pelger, R. C., & Elzevier, H. W. (2020). Sexual health needs: How do breast cancer patients and their partners want information? *Journal of Sex and Marital Therapy*, *46*(3), 205-226. <https://doi.org/10.1080/0092623x.2019.1676853>
- Cheng, K. K., Lim, Y. T., Koh, Z. M., & Tam, W. W. (2017). Home-based multidimensional survivorship programmes for breast cancer survivors. *Cochrane Database of Systematic Reviews*, *8*, Article n°: CD011152. <https://doi.org/10.1002/14651858.CD011152.pub2>
- Direção-Geral da Saúde. (2017). *Programa Nacional para as Doenças Oncológicas 2017*.
- Dragun, A. E., Huang, B., Tucker, T. C., & Spanos, W. J. (2012). Increasing mastectomy rates among all age groups for early stage breast cancer: A 10-year study of surgical choice. *The Breast Journal*, *18*(4), 318-325. <https://doi.org/10.1111/j.1524-4741.2012.01245.x>
- European Organisation for Research and Treatment of Cancer. (2001). *EORTC QLQ-C30 Scoring manual* (3<sup>rd</sup> ed.). <https://www.eortc.org/app/uploads/sites/2/2018/02/SCmanual.pdf>
- Ergun, M., Eyigor, S., Karaca, B., Kisim, A., & Uslu, R. (2013). Effects of exercise on angiogenesis and apoptosis-related molecules, quality of life, fatigue and depression in breast cancer patients. *European Journal of Cancer Care*, *22*(5), 626-637. <https://doi.org/10.1111/ecc.12068>
- Ferlay, J., Colombet, M., Soerjomataram, I., Dyba, T., Randi, G., Bettio, M., Gavin, A., Visser, O., & Bray, F. (2018). Cancer incidence and mortality patterns in Europe: Estimates for 40 countries and 25 major cancers in 2018. *European Journal of Cancer*, *103*, 356-387. <https://doi.org/10.1016/j.ejca.2018.07.005>
- Ferlay, J., Colombet, M., Soerjomataram, I., Mathers, C., Parkin, D. M., Piñeros, M., Znaor, A., & Bray, F. (2019). Estimating the global cancer incidence and mortality in 2018: GLOBOCAN sources and methods. *International Journal of Cancer*, *144*(8), 1941-1953. <https://doi.org/10.1002/ijc.31937>
- Forjaz de Lacerda, G., Kelly, S. P., Bastos, J., Castro, C., Mayer, A., Mariotto, A. B., & Anderson, W. F. (2018). Breast cancer in Portugal: Temporal trends and age-specific incidence by geographic regions. *Cancer Epidemiology*, *54*, 12-18. <https://doi.org/10.1016/j.canep.2018.03.003>
- Ghizzani, A., Bruni, S., & Luisi, S. (2018). The sex life of women surviving breast cancer. *Gynecological Endocrinology*, *34*(10), 821-825. <https://doi.org/10.1080/09513590.2018.1467401>
- Hidding, J. T., Beurskens, C. H., van der Wees, P. J., van Laarhoven, H. W., & Nijhuis-van der Sanden, M. W. (2014). Treatment related impairments in arm and shoulder in patients with breast cancer: A systematic review. *PloS One*, *9*(5), e96748. <https://doi.org/10.1371/journal.pone.0096748>
- Lovelace, D. L., McDaniel, L. R., & Golden, D. (2019). Long-term effects of breast cancer surgery, treatment, and survivor care. *Journal of Midwifery & Women's Health*, *64*(6), 713-724. <https://doi.org/10.1111/jmwh.13012>
- McGuire, K., Santillan, A. A., Kaur, P., Meade, T., Parbhoo, J., Mathias, M., Shamehdi, C., Davis, M., Ramos, D., & Cox, C. E. (2009). Are mastectomies on the rise?: A 13-year trend analysis of the selection of mastectomy versus breast conservation therapy in 5865 patients. *Annals of Surgical Oncology*, *16*(10), 2682-2690. <https://doi.org/10.1245/s10434-009-0635-x>
- Olsson Möller, U., Beck, I., Rydén, L., & Malmström, M. (2019). A comprehensive approach to rehabilitation interventions following breast cancer treatment: A systematic review of systematic reviews. *BMC Cancer*, *19*(1), Article number 472. <https://doi.org/10.1186/s12885-019-5648-7>
- Pais-Ribeiro, J., Pinto, C., & Santos, C. (2008). Validation study of the portuguese version of the QLC-C30-V.3. *Psicologia, Saúde e Doenças*, *9*(1), 89-102.
- Paolucci, T., Bernetti, A., Bai, A. V., Segatori, L., Monti, M., Maggi, G., Ippoliti, G., Tinelli, L., Santilli, V., Paoloni, M., Agostini, F., & Mangone, M. (2021). The sequelae of mastectomy and quadrantectomy with respect to the reaching movement in breast



cancer survivors: Evidence for an integrated rehabilitation protocol during oncological care. *Support Care Cancer*, 29(2), 899-908. <https://doi.org/10.1007/s00520-020-05567-x>

The Global Cancer Observatory. (2021). *Cancer today: Population fact sheets: Portugal*. <https://gco.iarc.fr/today/data/factsheets/populations/620-portugal-fact-sheets.pdf>

The Global Cancer Observatory. (2020). *Estimated number of new cases from 2020 to 2040, Incidence, Females, age [0-85+]: Breast*. <https://gco.iarc.fr/tomorrow/en/dataviz/tables?mode=popula->

[tion&cancers=20&populations=8\\_40\\_56\\_70\\_100\\_112\\_191\\_196\\_203\\_208\\_233\\_246\\_250\\_276\\_300\\_348\\_352\\_372\\_380\\_428\\_440\\_442\\_470\\_498\\_499\\_528\\_578\\_616\\_620\\_642\\_643\\_688\\_703\\_705\\_724\\_752\\_756\\_804\\_807\\_826&types=0&sexes=2](https://gco.iarc.fr/tomorrow/en/dataviz/tables?mode=population&cancers=20&populations=8_40_56_70_100_112_191_196_203_208_233_246_250_276_300_348_352_372_380_428_440_442_470_498_499_528_578_616_620_642_643_688_703_705_724_752_756_804_807_826&types=0&sexes=2)

Zabit, F., & Iyigun, G. (2019). A comparison of physical characteristics, functions and quality of life between breast cancer survivor women who had a mastectomy and healthy women. *Journal of Back and Musculoskeletal Rehabilitation*, 32(6), 937-945. <https://doi.org/10.3233/bmr-181362>

