

Work Ability Among Long-term Breast Cancer Survivors – Exploring the Role of Social Support in a Nation-wide Study

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Abstract

work ability (WA) is scarce. We aimed to identify factors, including social support, associated with excellent WA in a nation-wide population of long-term BCS.

Methods

All long-term BCSs (20-65 years) diagnosed with early-stage BC in 2011 or 2012 were identified by the Norwegian Cancer Registry in 2019 and invited to participate in a survey (n=2803). WA was assessed using the Work Ability Index. Factors associated with excellent WA were identified using univariate and multivariate logistic regression analyses, adjusted for sociodemographic-, health- and cancer related variables.

Results

The final sample consisted of 926 BCSs with a mean age of 56 years at survey. WA was reduced from 8.9 (SD 2.3) at diagnosis to 6.3 (SD 3.1) eight years later. One in three BCSs reported poor WA, and seven out of ten reported that their physical WA was reduced due to cancer. Survivors with excellent WA reported high social support from supervisors and colleagues compared to BCSs with low WA. Additionally, cognitive impairment and fatigue were negatively associated with WA.

Conclusion

WA remains a significant challenge in long-term BC survivorship, with a substantial proportion of BCSs reporting poor WA eight years after diagnosis. Collegial support appears to be a protective factor for sustained WA, whilst survivors struggling with fatigue and cognitive impairments may represent a particularly vulnerable group for discontinued employment. Increased attention to WA in follow-up care is warranted.

Introduction

Work ability (WA) may be defined as an individual's physical, psychological and social resources for participation in any kind of paid work or self-employment [1]. For breast cancer survivors (BCSs) WA is a key issue given the importance of work participation on identity, quality of life, financial security, and social relations [2, 3]. As the majority of BC patients are diagnosed within working age, and their lifetime expectancy is long [4], securing their WA long-term represents an important societal issue as well.

Studies have consistently demonstrated that most BCSs successfully return to work (RTW) within two years post diagnosis [5-8] and that WA increases during this time [5]. The question remains of what happens after the first two years, and whether WA changes along the survivorship trajectory [7]. Long-term BC survivorship (>5 years) has received less attention concerning WA compared to the RTW phase, except for a few studies reporting poorer WA among early-stage BCSs compared to healthy, age-matched controls [1, 9]. This phase may be challenging given a high risk of treatment related late effects (LEs),

including fatigue, cognitive dysfunction, pain, sleep problems, depression and fear of cancer recurrence [10, 11], which may reduce WA and represent barriers to sustained employment [12].

In Scandinavian populations, social support has been shown to reduce the effects of psychological and physical distress and increase over-all well-being [13, 14]. Furthermore, it may buffer the effects of different LEs, such as depression and anxiety [15], and increase over-all quality of life [16]. Limited support may increase the risk of early retirement and long-term sick-leave [14]. Colleagues, supervisors and general practitioners (GPs) represent important sources of social support for BCSs in the RTW-process [17], attending to practical, emotional and informational needs.

Despite its relevance and importance, there is a substantial gap in knowledge concerning WA among long-term BCSs, especially related to the identification of protective factors which may facilitate sustained WA. Such knowledge would not only be valuable for BCSs, but also for providers of support, as it may guide them to adequately assist BCSs struggling work related issues. Lastly, identifying modifiable factors may translate into targets for future interventional studies opting at increasing WA among long-term BCSs. The aims of this study were to 1) explore different aspects of long-term BCSs' WA and 2) identify factors associated with excellent WA in a nation-wide sample of long-term BCSs.

Material And Method

Study population

The **Survivorship Work and Sexual Health (SWEET)**-study was a nation-wide questionnaire study of Norwegian long-term BCSs with the primary study objective to explore work life experiences >five years after diagnosis. Women aged 20-65 years who had been diagnosed with early-stage (I-III) BC in 2011 or 2012 were identified by the Cancer Registry of Norway (CRN) and invited to participate. They had to be free of prior or subsequent malignancies with the exception of ductal carcinoma in situ and non-melanoma skin cancer. In total, 2803 women were invited, and 1361 (49%) survivors responded after receiving one written reminder.

In this sub-study, survivors who were older than the legal retirement age in Norway at time of survey (≥ 67 years, $n=349$) were excluded, as were survivors with incomplete consent ($n=3$), self-reported BC recurrence ($n=3$), missing data on work status ($n=31$) or missing data on the work ability score ($n=49$), leaving a final sample of 926 BCSs.

Primary outcomes

WA was assessed using the work ability index (WAI) which is based on self-report [13]. Three of the original seven items of the WAI were considered relevant in this cancer specific setting [18]. Item one, known as the work ability score (WAS), asked survivors to rate their current WA on a scale from 0 to 10 points, where 10 points reflect highest possible WA and zero implies extinguished WA. As recommended,

WAS were categorized into four; poor (WAS category 1, score 0-5), moderate (WAS category 2, score 6-7), good (WAS category 3, score 8-9) and excellent (WAS category 4, score 10). The WAS has been identified as a valid indicator of WA [19].

In item two of the WAI survivors were asked to describe their current WA with respect to the physical and the mental demands of their work. Response categories range from very bad (1) to very good (5). In item three, survivors were asked to rate to what extent their physical and mental WA has been affected by cancer. Response categories range from a lot (1) to not at all (5). The WAI has been reported to have good validity and has been used extensively in clinical occupational health research [20].

Explanatory variables

Cancer-related variables including age at diagnosis and information on surgical treatment (mastectomy or breast conserving therapy) were supplied by the CRN. All other variables were based on self-report.

Sociodemographic information included age at survey, living arrangements (with or without a partner) and educational attainment (long; >12 years and short; ≤12 years).

Work status was categorized as paid work, disability pension, retired or 'other statuses' (including job seeker, temporarily laid off, work allowance, education or military service and homemaker). Paid work included full- and part time work, self-employment and sick leave. In order to assess change in WA from diagnosis to survey, we asked survivors to rate their WA at time of diagnosis on the same scale (0-10) as used for the WAS.

Social support during cancer therapy was described using the 12-items version of the Structural and Functional Support Scale (SFSS) [21] in which survivors rate to what extent they received support from their supervisor (items 1-4), colleagues (items 5-8) and GP (items 9-12). Each item had five response categories, ranging from 1 (not at all) to 5 (a lot). For each of the three support providers a sum score was calculated, ranging from 4-20 [14]. We also dichotomized the score into high (score 11-20) and low (score 4-11) support. The SFSS is reported to have good psychometric properties [21]. Cronbach's alpha for the SFSS was 0.9.

Current social support at the work place was described using the support sub-scale from the Demand Control Support Questionnaire (DCSQ) [22], which includes six positive statements concerning the general atmosphere at the work place and the support provided from supervisors and colleagues. Survivors rated their level of agreement with these statements on a four-point scale from complete agreement (1) to no agreement at all (4), yielding a sum score from 6-24, where lower values indicate higher social support. Cronbach's alpha was 0.9 for the DCSQ.

Use of primary health care services was explored by asking survivors to report the number of visits to the GP during the last 12 months.

Life style factors included overweight (defined as body mass index (BMI) $\geq 25\text{kg/m}^2$) and physical activity. The latter was explored using a modified version of the Godin Leisure Time Exercise Questionnaire [23], classifying the survivors as either physically active (≥ 150 minutes of moderately intense- or ≥ 75 minutes of vigorously intense weekly activity) or inactive.

Sleep problems were defined as having more than three episodes per week of difficulty falling asleep and/or waking up too early and not being able to fall asleep again during the last three months (yes/no) [24].

Neuropathy was assessed using two items from the scale of chemotherapy induced long-term neurotoxicity (SCIN) [25], which asks survivors to describe the presence or absence of neuropathy in hands and feet with response alternatives ranging from 0 (not at all) to 3 (very much), yielding a sum score from 0-6. The sum score is then, as recommended by the authors [25], dichotomized into high (≥ 4) and low (≤ 3) degree of neuropathy.

Using subscales from the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire (EORTC QLQ-C30) version 3 [26], cognitive function, pain and fatigue were reported, while arm and breast symptoms were assessed using the breast cancer specific module (EORTC BR 23)[27]. Items were rated from 1 (not at all) to 4 (very much) and transformed to a 0-100 scale as recommended in the EORTC scoring manual. More severe pain, fatigue, arm and breast symptoms result in higher symptom scores, while higher cognitive function yields a higher functional score. Cronbach's alphas were 0.7 for cognitive functioning, 0.9 for pain and fatigue, 0.8 for arm- and breast symptoms.

Depressive symptoms was explored using the Patient Health Questionnaire, the PHQ-9 [28], which rates the frequency of depressive symptoms over the last two weeks. Responses range from not at all (0) to nearly every day (3), providing a sum score from 0-27. We imputed values for the PHQ-9 by substituting missing values with mean values if no more than two items were missing. Cronbach's alpha for the PHQ-9 was 0.8.

Symptoms of anxiety were evaluated using the General Anxiety Disorder 7-item tool (GAD-7)[29], which rates the presence of anxiety during the last two weeks, scored from 0 (not at all) to 3 (nearly every day) resulting in a sum score from 0-21. We imputed values for the GAD-7 by substituting missing values with mean values when more than 50% of items had been answered. Cronbach's alpha for GAD-7 was 0.9.

Fear of cancer recurrence was assessed using four items from the Concern About Recurrence Questionnaire (CARQ) [30], which includes an assessment of the frequency and degree of distress (first three items) and a self-perceived risk of recurrence assessment from 0-100% (fourth item). As recommended, the fourth item was converted to a 0-10 scale to be in accordance with the other items. A sum score from 0-40 was calculated. Cronbach's alpha for CARQ was 0.7.

Statistical analyses

Descriptive analyses were performed for the total sample, describing continuous variables using means and standard deviations (SD) and categorical variables as numbers and percentages (%).

To describe the relationship between social support during cancer therapy and WA, we performed cross tabulations between the different items of SFSS for each provider of support and WAS. P-values from Pearson's chi-squared test and Cramér's V were reported.

To explore factors associated with excellent WA we applied logistic regression models with WAS as the dependent variable (score 10 vs. score 0-9). BMI was considered a continuous variable. Explanatory variables associated with excellent WA at significance level of ≤ 0.2 in univariable analyses were included in the multivariable model.

Collinearity statistics were performed for sets of variables which theoretically may overlap. This included age at diagnosis, cognitive function, fatigue, depression, anxiety and fear of cancer recurrence, with highest observed variation inflation factor (VIF) of 3.3 which is considered acceptable. As fear of cancer recurrence and anxiety has overlapping symptomatology, we chose to exclude anxiety from the final model. Furthermore, as the majority of BCSs who were disabled at time of survey rated poor current WAS, and work status and WA is closely related, we excluded work status from the regression analyses. Results were presented as odds ratios (ORs) with 95% confidence intervals (95%) and accompanying p-values.

In order to assess the potential risk of non-response bias, the CRN provided data concerning cancer-related variables for the non-responders. Comparisons of responders vs. non-responders were performed by comparing mean values for these selected variables.

All analyses were performed using IBM SPSS version 26.0 (SPSS, Chicago, IL).

Results

Patient characteristics

BCSs were on average 56 years old at survey, and eight years had passed since BC diagnosis. The majority lived with a partner (76%) and had long education (58%). At diagnosis, 89% were in paid work, while 59% were in paid work at survey. Mean WAS at survey was 6.3 (SD 3.1), reduced from 8.9 (SD 2.3) at time of diagnosis. About half of the survivors were overweight (53%) and 57% were categorized as physically inactive. Almost 80% had received chemotherapy (Table 1).

Work ability

Sixteen percent rated their WA as excellent, while 33% rated their WA as poor. Close to 45% (44.8%) reported good or excellent WA. With respect both to the physical and mental demands of their work, 34% rated their WA as very good. On the other end of the scales, 15% and 13% rated their WA as quite bad or very bad with regards to the physical and mental demands at work respectively. Approximately 72%

(71.7%) reported that their physical WA had been reduced due to cancer; while 68% reported that their mental WA had been reduced due to cancer (Table 2).

Social support

Survivors with excellent WAS reported that they had received a high degree of support from supervisors (72%) and from colleagues (79%) during cancer therapy, while 41% reported a high degree of support provided by their GP. Among survivors with poor WAS, significantly lower proportions (48 and 51% respectively) reported that they had received a high degree of support from their supervisor and colleagues compared to those with excellent WAS. The association between received support and WAS were significant for supervisor- and collegial support (Cramèr's V 0.16-0.19), but not for GP-provided support (Table 3).

After adjustments, collegial support during cancer therapy, but not supervisor support or current social support, remained positively associated with excellent WAS (OR 1.14, 95% CI: 1.0-1.29, p-value 0.03). Cognitive function was positively associated with excellent WAS (OR 1.02, 95% CI: 1.0-1.05, p-value 0.02), while fatigue remained inversely associated with excellent WAS (OR 0.94, 95% CI 0.94-0.99, p-value <0.01). Cancer related variables, work related variables and other LEs were no longer associated with excellent WAS (Table 4).

Attrition analyses

Compared to responders, non-responders in the SWEET-study (n = 1448) were on average 1.3 years older at diagnosis, had lower tumor proliferation markers (mean Ki67-value of 27 versus 31), and an additionally 4% were Her-2 negative (85% versus 81%) compared to the responders. The groups did not differ according to tumor size, nodal involvement, hormone receptor status or type of surgery (results not shown).

Discussion

This study indicates that BCSs continue to have work related challenges also beyond the first few years after diagnosis; one in three reported poor current WA and approximately 70% reported that their physical or mental WA had, to some degree, been reduced due to BC.

WA significantly diminished from time of diagnosis until survey eight years later. A WAS of 6.3 is lower than previously reported for BC samples. A Danish study on long-term BCSs examined > 5 years after diagnosis, did report a significantly poorer WA among BCSs compared to cancer-free controls (mean WAS of 8.7 compared to 8.9 among controls) [9], but still almost three points higher on the 0-10 scale than we report here. Also in a Nordic study, comparing WA among long-term survivors of breast-, prostate- and testicular cancer to findings in the general population, WA among BCSs was lower (WAS 8.4) compared

to cancer-free controls [31]. These studies only included survivors in paid work, and given the close association between work status and WA, this may account for relatively high WAS-scores.

A WAS of six is lower compared to that reported in other cancer survivor populations as well. There are reports that females report lower WA [1], more work-related limitations [32] and higher supportive care needs at work compared to men [14]. In a study on long-term Norwegian prostate cancer survivors, 75% of patients reported WAS at 8 or higher (good or excellent), and mean WAS for the total sample was 8.6 [33]. Whether gender is the common denominator here or if there are unique aspects related to BC treatment or survivorship influencing these observations is not known. In a mixed cancer sample including 26% BCSs examined eighteen months post diagnosis, De Boer et al reported a WAS of 6.7 [5]. Interestingly, they observed that WA steadily increased during the RTW process. Our findings may indicate that this positive development in WA may come to a halt at some time point during BC survivorship. Clinical factors related to diagnosis and cancer therapy have been identified as strong predictors for the RTW- process [34]. Eight years after BC diagnosis, none of the treatment- or cancer related variables were associated with WA. However, two of the most common LEs after BC, fatigue and cognitive impairment, were significantly associated with WA in the adjusted analysis. This finding is in line with the study by Carlsen et al who reported that fatigue is one of the factors strongest associated with low WA among long-term BCSs, increasing the risk of low WA close to eleven times [9]. Furthermore, BCSs here reported higher levels of fatigue and reduced cognitive function, than reported by age-appropriate Norwegian norms [35], thus confirming that a substantial proportion of BCSs struggle with these complaints more than five years post BC [36, 37]. From a clinical perspective this is important knowledge as it identifies at-risk sub-groups of BCSs who may be in need of specific attention.

Collegial support during cancer therapy was the only source of social support associated with excellent WA. This suggests that the more informal, day-to-day social support characteristic of a good working environment may be more important for WA than informational and practical support provided by supervisors and GPs. Interestingly, the same association was not observed for current social support at the work place. This suggests that how BCSs perceived their social support systems during cancer may have long-lasting effects on their WA.

The majority of BCSs rated their GP provided support as low- and lower than the other sources of social support explored here. Among survivors with poor WA, a larger proportion reported that they had received low support from their GP compared to the support they had received at their work place. Survivors with excellent WA reported a high degree of support from both supervisors and colleagues (72-79%), while only 41% of them reported high support from their GPs. The cross-sectional design of this study hinders us from concluding whether high social support results in high WA, or if having high WA reduces the need for social support. This relation may also differ between the different support providers. For instance, BCSs must actively seek contact with their GPs in order to receive GP support. BCSs with high WA are probably less likely to do so compared to BCSs struggling with work related issues. Furthermore, this study has shown that poor WA is associated with fatigue and cognitive challenges. These individuals may therefore be in closer contact with their GPs than those with high WA. Consequently, report on low

perceived GP support among those with high WA may merely reflect less need for and thus contact with this provider, while that of colleagues and supervisors is a more integrated part of their working environment. On the other hand, we cannot rule out the possibility that BCSs with low WA really lack work related support from their GPs. These findings therefore underline a need for increased attention to the GPs' role in BCSs follow-up care.

Strengths and limitations

The major strength of this study is the quality of the data. Survivors were identified by the CRN which provides close-to complete and highly accurate estimates for the Norwegian cancer population [38]. The results are therefore likely generalizable to BCSs of working age within societies with comparable welfare systems as ours. Sample size and the use of established and validated outcome-measures are also important strengths.

There are however several limitations that need to be addressed. Within more heterogeneous BC populations, especially regarding socioeconomic status, the results must be interpreted with caution. The Norwegian welfare systems offer financial security for those who are unable to work. Thus, reasons for staying within the work force may be different in non-Western populations and may not be directly comparable to our findings. The response rate in the SWEET-study of 49% is considered acceptable for current population-based studies [39]. For available variables the risk of selection bias was explored in attrition analyses and only minor differences between responders and non-responders were observed. Still, we cannot exclude that selection bias is present. The WAI and several of the explanatory variables included in the regression analyses, including SFSS, were based on self-report and may be object to recall-bias.

SFSS measures social support during cancer therapy and consequently we do not have information on present GP support. WA and supportive needs may have fluctuated since time of diagnosis. Given the design of the study, we cannot detangle whether social support influence WA, or if reverse associations are present and WA in fact impact perceived support and demand of support. Inference on causal effects is not possible.

Conclusion

One third of long-term BCSs reported low WA, and their WA had been substantially reduced since time of diagnosis. BCSs struggling with fatigue and cognitive dysfunction represent a particularly vulnerable group of BCSs where clinician attention is warranted. Collegial support stands out as the most important source of social support with regards to WA, and underlines the importance of work place support during cancer on long-term work outcomes for BCSs. Future efforts need to focus on improving and extending the role of the GPs concerning vocational guidance for long-term BCSs.

Declarations

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Conflict of interest:

The authors declare no conflict of interest.

Ethical approval:

This study was approved by the Regional Committee for Medical Research Ethics (2018/2170), the Norwegian Cancer Registry and the Data Protection Officer at Oslo University Hospital. All procedures were performed in accordance with the ethical standards of the national and institutional research committee and with the 1964 Declaration of Helsinki and its later amendments.

Informed consent:

Informed consent was obtained from all participants included in the study.

Availability of data:

all data is available at the National Advisory Unit for Late Effects After Cancer Treatment, Department of Oncology, Oslo University Hospital, the Radium Hospital, Oslo, Norway.

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Tables

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