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Authors

Osann, Kathryn

Wenzel, Lari

McKinney, Chelsea

et al.

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Fear of recurrence, emotional well-being and quality of life among long-term advanced ovarian cancer survivors

Kathryn Osann[a,*], **Lari Wenzel**[a], **Chelsea McKinney**[a], **Lynne Wagner**[b], **David Cella**[c], **Giulia Fulci**[d], **Mary J. Scroggins**[e,1], **Heather A. Lankes**[f,g], **Victoria Wang**[h], **Kenneth P. Nephew**[i], **George L. Maxwell**[j], **Samuel C. Mok**[k], **Thomas P. Conrads**[j], **Austin Miller**[l], **Michael Birrer**[m]

[a] Department of Medicine and Program in Public Health, University of California, 839 Health Sciences Rd, Irvine, CA 92697, USA

[b] Department of Social Sciences and Health Policy, Wake Forest University, 475 Vine Street, Winston-Salem, NC 27101, USA

[c] Department of Medical Social Sciences, Northwestern University Health System, 633 N St Clair St, Chicago, IL 60611, USA

[d] GlaxoSmithKline, 1000 Winter St, Waltham, MA 02451, USA

[e] International Gynecology Cancer Society, PO Box 170645, Austin, TX 78717, USA

[f] The GOG Foundation, Inc., Edgewater, MD 21037, USA

[g] Division of Gynecologic Oncology, Department of Obstetrics and Gynecology, The Ohio State University Wexner Medical Center, Columbus, OH 43210, USA

[h] Dana-Farber Cancer Institute, Department of Data Science, 450 Brookline Ave LC1052 or LC9310, Boston, MA 02215, USA

[*] Corresponding author at: Medicine, University of California, 839 Health Sciences Rd, Irvine, CA 92697, USA. kosann@uci.edu (K. Osann).

[1] Deceased.

Author contribution

Kathryn Osann: Conceptualization, Formal Analysis, Investigation, Data Curation, Writing, Reviewing & Editing, Funding Acquisition.
Lari Wenzel: Conceptualization, Investigation, Writing, Funding Acquisition.
Chelsea McKinney: Writing, Reviewing & Editing.
Lynne Wagner: Writing, Reviewing & Editing.
David Cella: Writing, Reviewing & Editing.
Giulia Fulci: Project Administration, Resources, Funding Acquisition.
Mary J. Scroggins: Funding Acquisition.
Heather A. Lankes: Reviewing & Editing, Funding Acquisition.
Victoria Wang: Reviewing & Editing, Funding Acquisition.
Kenneth P. Nephew: Reviewing & Editing, Funding Acquisition.
George L. Maxwell: Reviewing & Editing, Funding Acquisition.
Samuel C. Mok: Reviewing & Editing, Funding Acquisition.
Thomas P. Conrads: Reviewing & Editing, Funding Acquisition.
Austin Miller: Reviewing & Editing.
Michael Birrer: Supervision, Resources, Funding Acquisition.

Declaration of Competing Interest

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[i] Medical Sciences Program, Indiana University School of Medicine-Bloomington, 1001 E 3rd St, Bloomington, IN, 47405, USA

[j] Women's Health Integrated Research Center at Inova Health System, Women's Service Line, Inova Health System, 8110 Gatehouse Rd, Falls Church, VA 22042, USA

[k] Department of Gynecological Oncology & Reproductive Medicine, The University of Texas MD Anderson Cancer Center, P.O. Box 301439, Houston, TX 77230, USA

[l] Roswell Park Comprehensive Cancer Center, 665 Elm St, Buffalo, NY 14203, USA

[m] Winthrop P. Rockefeller Cancer Institute University of Arkansas for Medical Sciences, 4301 W. Markham St, Little Rock, AR 72205, USA

Abstract

Objective.—Although advanced stage epithelial ovarian cancer is widely considered life-threatening, 17% of women with advanced disease will survive long-term. Little is known about the health-related quality of life (QOL) of long-term ovarian cancer survivors, or how fear of recurrence might affect QOL.

Methods.—58 long-term survivors with advanced disease participated in the study. Participants completed standardized questionnaires to capture cancer history, QOL, and fear of recurrent disease (FOR). Statistical analyses included multivariable linear models.

Results.—Participants averaged 52.8 years at diagnosis and had survived >8 years (mean:13.5); 64% had recurrent disease. Mean FACT-G, FACT-O, and FACT-O-TOI (TOI) scores were 90.7 (SD:11.6), 128.6 (SD:14.8), and 85.9 (SD:10.2) respectively. Compared to the U.S. population using T-scores, QOL for participants exceeded that of healthy adults (T-score (FACT-G) = 55.9). Overall QOL was lower in women with recurrent vs. non-recurrent disease though differences did not reach statistical significance (FACT-O = 126.1 vs. 133.3, $p = 0.082$). Despite good QOL, high FOR was reported in 27%. FOR was inversely associated with emotional well-being (EWB) ($p < 0.001$), but not associated with other QOL subdomains. In multivariable analysis, FOR was a significant predictor of EWB after adjusting for QOL (TOI). A significant interaction was observed between recurrence and FOR ($p = 0.034$), supporting a larger impact of FOR in recurrent disease.

Conclusion.—QOL in long-term ovarian cancer survivors was better than the average for healthy U.S. women. Despite good QOL, high FOR contributed significantly to increased emotional distress, most notably for those with recurrence. Attention to FOR may be warranted in this survivor population.

Keywords

Ovarian cancer; Long-term survival; Fear of recurrence; Quality of life; Emotional well-being

1. Introduction

Ovarian cancer is the fifth leading cause of cancer mortality in women and the leading cause of death among reproductive cancers [1]. While the 5-year survival rate for stage I disease

is approximately 90%, less than one quarter of ovarian cancers are diagnosed at this stage. Most ovarian cancer is diagnosed at stage III/IV where the 5-year survival rate is only 31%. >70% of these women will experience at least one recurrence of their disease. Despite the poor prognosis, 17% of women diagnosed with stage III/IV ovarian cancer will survive 10 years or longer [2].

Past research revealed associations between overall survival and both QOL at diagnosis and change in QOL across the treatment period [3–6]. Many studies focused on early-stage ovarian cancer and women with no recurrence, reporting good-to-excellent QOL, comparable to a healthy normal population, for women surviving at least 3 years [7–10]. A few have reported good QOL at 3 or more years follow-up (average > 6) among women with advanced stage ovarian cancer [11–13]. Relatively little data is available for QOL in long-term survivors.

Women with recurrent disease reported good overall QOL relative to healthy women, but tended toward lower scores compared to those with no recurrence [13–16]. Following recurrence, women more frequently report sexual dysfunction and psychological distress, including anxiety, depression and fear of recurrence, (FOR) [7–10,13,17]. FOR has been associated with lower QOL, higher psychological distress and increased symptoms among ovarian and other cancer survivors [9,13,18,19].

This study aims to characterize QOL and related psychological distress due to fear of recurrent disease in a sample of women diagnosed with advanced stage (stage III-IV) epithelial ovarian cancer who have survived at least 8 years with and without recurrent disease.

2. Methods

2.1. Study population

The Ovarian Cancer Consortium for Long-Term Survival was established to better understand the molecular, biologic, and patient-reported outcome (PRO) characteristics of long-term survivors. Recruitment was initiated in 2016 to develop a cohort of long-term survivors (>8 years) of advanced stage ovarian cancer. A structured interview and quantitative QOL study, including socio-demographics, cancer and medical history, quality of life, access to care and survivor-specific distress, aimed to better identify long-term consequences of diagnosis and treatment, thereby informing development of improved treatment and supportive care. Inclusion criteria include 1) women between the ages of 18 and 80, 2) diagnosis with stage III-IV ovarian, peritoneal or fallopian tube cancer 8 or more years prior to recruitment, and 3) English speaking. Survivors were identified through outpatient clinics, physician referral, a patient volunteer registry, internet advertisements in online cancer-related websites, and flyers posted publicly at Massachusetts General Hospital and Brigham and Women’s Hospital in Boston, MA. Informed consent was obtained via telephone. Participants completed the PRO measures after study consent. Recurrent disease status was based on self-report at the time of consent.

2.2. Quantitative measures

The Functional Assessment of Cancer Therapy-Ovarian (FACT-O), a multidimensional, questionnaire to assesses quality of life (QOL) in ovarian cancer patients, was administered to women who had survived at least 8 years from initial diagnosis. Total scores range from 0 to 164, with higher scores indicating better QOL. The FACT-O questionnaire includes the 27-item FACT-G (general) questionnaire (version 4), consisting of 4 subscales (physical well-being (PWB), functional well-being (FWB), social well-being (SWB), and emotional well-being (EWB)), plus the 14-item additional ovarian cancer-related concerns subscale (AC). The FACT-O has good reliability and validity for assessing QOL in women with epithelial ovarian cancer [20]. Subscales can be analyzed separately, summed to produce a summary QOL score (FACT-G or FACT-O), or a subset can be summed to create the FACT-O-Trial Outcome Index (TOI). The TOI is strongly associated with long-term survival in clinical trials, likely reflecting both response to treatment, disease symptoms, and adverse effects of treatment [6]. Standardized scores ranging from 0 to 100 are available for the FACT-G, PWB, FWB, EWB, SWB, and AC to facilitate comparison between these subscales. In addition, raw FACT-G and subscale scores can be converted to *T*-scores that rescale raw scores into standardized scores with mean = 50 and standard deviation = 10 based on a standard population of the U.S. general population [21].

The 4-item FACIT Fatigue subscale was used to quantify fatigue in participants [22]. Neurotoxicity was assessed using the 4-item version of the FACT/Gynecologic Oncology Group Neurotoxicity (FACT/GOG-NTX) subscale. This abbreviated version has shown good reliability and validity in clinical trials [23]. The FACT/GOG-Abdominal Discomfort Scale (FACT/GOG-AD) was used to assess ovarian cancer-specific abdominal discomfort. Good reliability and validity have been established for the 4-item version [24].

FOR was assessed using the question “How distressing were the following aspects of your illness and treatment: Recurrence of your cancer.” This item, assessed on a scale of 0 (no fear) to 10 (extreme fear), was derived from the Survivor-Specific Distress (SSD) scale, an ordinal subscale adaptation of the Cancer Patient/Cancer Survivor version of the Quality of Life Instrument [16]. Other questions included fear of future tests, second cancer, and metastases and were highly correlated with FOR ($r = 0.7–0.8$). After investigating FOR and fear of progression in breast and ovarian cancers, Coutts-Bain et al. [25] concluded that despite some overlapping predictors, these two items represent separate constructs. Thus, we have restricted analyses to the single question on fear of cancer recurrence. Recurrent disease (yes or no) and number of recurrences were assessed by self-report from participants.

Other adverse effects experienced by LTS including sleep disturbance and sexual problems were assessed by items included in the FACT-O questionnaire. Sleep disturbance was assessed by the item “I am sleeping well”. Sexual problems were assessed by two questions “I am interested in sex” and “I am satisfied with my sex life”. Responses “quite a bit” to “very much” were considered high compared to responses “not at all”, “a little bit” or “somewhat”, which were considered low. In addition, we measured several health behaviors including participation in exercise, exercise frequency, and dietary changes post diagnosis that might be related to quality of life among long-term survivors.

2.3. Statistical analysis

Distributions are described using descriptive statistics, including mean and standard deviation (SD) for continuous variables, and frequency and percent for categorical variables. Distributions for number of recurrences and FOR were non-normal. Thus, participants were stratified into 2 subgroups based on recurrence of disease (no vs ≥1 recurrence) and 3 approximately equal subgroups based on FOR (low = 0 to 3; moderate = 4 to 7; high = 8 to 10). Differences between subgroups with respect to QOL were tested using two-group *t*-tests and analysis of variance methods. Factors associated with EWB were examined using a multivariable linear model, specified to include an interaction test for the moderating effect of prior recurrence on FOR. Because the TOI is associated with overall QOL and predictive of long-term survival in clinical trials, the TOI score was included as a covariate in the model. One item of the EWB, "I worry that my condition will get worse", may be correlated with FOR. Hence, sensitivity analysis was conducted to examine the influence of this EWB item. Statistical analyses to examine associations between recurrence status and FOR were repeated after removing this item from the EWB total score. Data analysis was conducted using SYSTAT version 13.2 [26]. *P*-values <0.05 were considered statistically significant. Significance tests were not adjusted for the effects of multiple testing.

3. Results

A total of 58 long-term survivors of advanced stage epithelial ovarian cancer consented to participate in this study. Women averaged 52.8 years at diagnosis (65.2 years at interview; Table 1). Survival time following diagnosis ranged from 8 to 30 years (mean = 13.5, SD = 5, median = 12). Women were predominantly Caucasian/Non-Hispanic (94.3%), married or living with a partner (67.3%), and highly educated (69% completed college or graduate school). Approximately one-third had no recurrence following initial diagnosis (21/58 = 36.2%), while 37 (63.8%) had ≥1 recurrence and 14 (24.1%) that had ≥3 recurrences prior to completing the QOL survey (mean number of recurrences = 1.5, SD = 1.6). 42/58 (72.4%) of participants had stage III disease, 9 (15.5%) had stage IV disease and 7 (12.1%) had advanced disease of unspecified stage. All participants were treated with both surgery and chemotherapy.

3.1. Quality of Life

For all participants, QOL exceeded the average, regardless of recurrent disease, with overall mean scores for all participants for the FACT-G of 90.7 (SD = 11.6, range 58–106) and FACT-O of 128.6 (SD = 14.8, range 82–151) (Table 2). When standardized to a 0–100 score, the mean standard score for the FACT-G was 64.0 (SD = 8.1, range 50–84). Subdomain scores for physical (PWB), functional (FWB), social (SWB) and emotional well-being (EWB) reflect good QOL for each subdomain (mean scores of 24.3, 23.3, 22.4, and 20.1 respectively) with standard scores ≥69.4 for each subdomain. T-scores, comparing this population of long-term ovarian cancer survivors to the healthy U.S. adult female population (mean = 50.0), were 55.9 for mean FACT-G total and 52.7, 57.1, 54.9 and 50.4 for mean PWB, FWB, SWB and EWB subdomains respectively, showing overall QOL and all subdomains approximately equal to QOL in a healthy population [21]. 82.1% of our long-term survivors had T-scores for the FACT-G above 50, the average for the healthy U.S.

population, while a smaller proportion, 64%, had T-scores for EWB above 50, with 36% scoring below average.

3.2. Recurrent disease

Women without recurrence did not differ significantly from women with recurrent disease with respect to age at diagnosis (54.0 vs. 52.1, $p = 0.458$), age at interview (65.9 vs. 64.8, $p = 0.656$) or survival years (12.8 vs. 13.9, $p = 0.411$). There were no statistically significant differences in QOL scores between long-term survivors with no recurrence and those with one or more recurrences (Table 2). However, overall QOL as measured by the FACT-O was lower for women with recurrent disease compared to women with no recurrence (FACT-O total scores of 126.1 [SE = 2.6] and 133.3 [SE = 2.1] respectively), approaching statistical significance ($p = 0.082$). FACT-G and TOI scores were also lower among women who had experienced a recurrence compared to women with no recurrence (FACT-G: 88.8 [SE = 2.0] and 94.3 [SE = 2.3], and TOI: 84.1 [SE = 1.8] and 89.1 [SE = 1.9] for recurrent vs. non-recurrent disease respectively), approaching but not reaching statistical significance ($p = 0.090$ for FACT-G and $p = 0.080$ for TOI for recurrent vs non-recurrent disease). FACT-G subdomain scores did not differ significantly between those with and without recurrence ($p = 0.148$ to $p = 0.438$, see Table 2). Numbers in each subgroup were small and power to detect significant differences associated with recurrent disease was limited.

Long-term survivors with history of recurrent disease reported more fatigue compared to women who remained recurrence free (mean scores 10.8 (SE = 0.7) vs. 12.7 (SE = 0.6)), although differences did not reach statistical significance ($p = 0.060$). Disease recurrence was not significantly associated with neurotoxicity, abdominal discomfort or sleep problems in this sample ($p = 0.774$, $p = 0.104$ and $p = 0.288$ respectively). A minority of participants (17/49 = 35%) reported they were quite a bit to very much satisfied with their sex life, however satisfaction did not differ by recurrence status ($p = 0.275$). Interest in sex was low for all long-term survivors (11/54 = 20% reported quite a bit to very much interest) and statistically significantly lower for those with recurrent disease (12% vs. 35%, $p = 0.041$). A high proportion of long-term survivors reported current participation in exercise (44.51 = 86%), however there were no significant differences by recurrence status in participation rates or frequency of exercise ($p = 0.686$ and $p = 0.558$ respectively). Long-term survivors with recurrent disease were more likely to change their diet post diagnosis, most reporting an increase in consumption of fruits and vegetables ($p = 0.044$).

3.3. Fear of recurrence

Despite good QOL in all subjects, high FOR (response ≥8 on a Likert scale of 0–10) was experienced by approximately one quarter of participants (15/55; 27%). High FOR was reported by participants with recurrent disease (12/35; 34.3%) and by those with no recurrences (3/20; 15%). When stratified by level of FOR, overall QOL did not differ significantly (FACT-O = 133.1 and 129.4 for high vs. low FOR, FACT-O difference = 3.7, $p_{trend} = 0.484$; Table 3). Similar non-significant differences were observed for the FACT-G and TOI (difference = 4.1 with p_{trend} $p = 0.323$, and difference = −0.2 with $p_{trend} = 0.955$ respectively). Examination of subdomains, however, showed statistically significantly lower EWB for subjects with higher FOR ($p_{trend} < 0.001$, difference between low fear and high

fear subgroups = 3.7). Differences across FOR strata for PWB, FWB, AC and SWB were not statistically significant, with small differences between low and high fear subdomain scores for PWB, FWB, AC and SWB of ($p_{trend} > 0.34$, low-to-high differences = 1.2, −1.1, −0.3 and −0.4 respectively). A sensitivity analysis was conducted to examine whether the lower EWB for participants with high FOR was explained by the EWB item "I worry that my condition will get worse". After removing this item from the EWB subscore total, subjects with higher FOR continued to exhibit significantly lower EWB ($p_{trend} = 0.030$).

High FOR was statistically significantly associated with change in diet post diagnosis ($p = 0.006$), and there was a nonsignificant association with current exercise. Long-term survivors with high FOR were more likely to participate in current exercise (87% vs. 74%, $p = 0.072$) and to participate with greater frequency per week ($p_{trend} = 0.066$). There were no significant differences between high and low FOR participants on symptoms associated with treatment and/or progressive disease including fatigue, abdominal discomfort, neurotoxicity, sleep problems, or sexual interest and satisfaction.

3.4. Multivariable analysis

A multivariable linear model was used to examine the independent roles of TOI, which may reflect the adverse effects of treatment and/or progressive disease, recurrent disease and FOR in prediction of EWB in our long-term survivor population (Table 4). Survivors who reported lower TOI had significantly lower EWB, independent of recurrent disease and FOR ($p < 0.001$). Higher FOR was significantly associated with lower EWB ($p = 0.022$), independent of covariates. Further, there was a significant interaction between FOR and recurrent disease ($p = 0.034$), suggesting that FOR had a stronger effect on EWB among those with recurrent disease. While there was no decreasing trend in EWB with increasing FOR among those who had not experienced a recurrence of their disease, EWB decreased with increasing FOR in long-term survivors who had experienced one or more recurrences (Fig. 1). Numbers were small and the ability to detect a significant trend was limited.

T-scores comparing EWB for this population of long-term ovarian cancer survivors to the healthy U.S. adult female population range from an above average value of 54.1 for women with low FOR to a below average value of 46.3 for survivors with high fear. Among women with recurrent disease, the T-score for women with low FOR was 55.5 compared to a T-score of 44.8 for women with high fear. The lower T-scores associated with high compared to low FOR (a difference of 7.8 for all survivors, 10.7 for recurrent disease) reflect a clinically meaningful difference in T-scores of >5 points for EWB associated with high FOR [21].

4. Discussion

This descriptive study focused on a rare group of cancer survivors, i.e., women diagnosed with stage III or IV ovarian cancer who had survived at least 8 years. Despite the high frequency of recurrent disease in this sample (64% with ≥1 recurrence, 43% with ≥2 recurrences), women reported QOL equal to or above the average for the US healthy female population. T-scores for the FACT-G and all subdomains (PWB, SWB, EWB, FWB) were above the average value of 50 for healthy women [21]. Good overall QOL in ovarian cancer

survivors is consistent with studies that included mostly women with early-stage disease [8–10,15] as well as 3 studies focused on patients with advanced stage disease [11–13].

However, several investigators have reported lower QOL in ovarian cancer survivors compared to healthy controls [7,27,28], necessitating further examination of potential differences between those with and without recurrence. In the study reported herein, overall QOL was lower for women with recurrence compared to women without recurrence, although the difference did not reach statistical significance. This is consistent with results from Lutgendorf et al. [13] who noted significantly lower QOL in women with ≥2 compared to 0–1 recurrences, and similar to reports of others [14,15]. Similar to other studies recruiting from academic medical centers, our sample included a high proportion of women with college or graduate degrees [12,13,15]. While we did not find a significant association between QOL and educational level in our study, only 4 long-term survivors reported a high school education or less. It is possible that higher educational level and associated socioeconomic status may contribute to the high QOL observed in our study and others. Our relatively small sample size may have limited us from detecting statistically significant QOL total score or subdomain differences across subgroups.

Sexual function is often a neglected but important area of study for gynecologic cancer survivors. Among our sample, interest in sex was low in all long-term survivors, but significantly lower in women with recurrent disease ($p = 0.041$), which is consistent with an earlier body of literature [8–10,12,13].

Fear of cancer recurrence of moderate intensity is commonly reported among cancer survivors [17–19,29]. FOR may be stable over the survival period and is negatively associated with QOL [29]. FOR did not vary significantly with survival time beyond 8 years for those with or without recurrent disease in our sample, although power for this comparison was limited. The prevalence of moderate-to-high FOR in cancer survivors is estimated at 22–87%, and approximately 15% for high FOR [30]. In our sample of LTS, 65% (36/55) reported moderate-to-high FOR and 27% (15/55) reported high FOR. While there were no significant differences in overall QOL with level of fear (Table 3), we observed significantly lower emotional well-being with higher reported FOR ($p < 0.0005$).

In our multivariable analysis, higher FOR was significantly associated with lower EWB after adjusting for QOL (TOI) and cancer recurrence ($p = 0.022$). A significant interaction between FOR and recurrence suggests that FOR may have a stronger effect on psychological distress among women with recurrent ovarian cancer than those without recurrence. The association between FOR and emotional distress has been observed in other studies of ovarian cancer survival [9,12,13]. It has been hypothesized that FOR is an intermediary between physical symptoms and perceived stress [18,19]. Our data, however, do not support this hypothesis, as we find no association between FOR and physical, functional, or ovarian symptom concern domains. Our multivariate model demonstrates that FOR is strongly associated with emotional distress after adjusting for the other domains (e.g., physical, functional, ovarian symptoms).

FOR has been suggested as a motivator for health behavior changes, either positive changes or maladaptive changes due to increased perceived stress [18]. Although we had limited data to assess health behavior changes, our data suggested that while there is little difference among long-term survivors with low and high fear in whether they exercise or not (100% vs. 87% exercise for low vs. high fear), those with high fear may exercise more frequently ($p = 0.066$). Furthermore, long-term survivors with high fear were significantly more likely to make changes in their diet by increasing consumption of fruits and vegetables ($p = 0.006$). Addressing FOR in a long-term advanced ovarian cancer survivor population is complicated, regardless of recurrence status. This fear does appear to negatively impact emotional well-being which may deserve interventions targeting fear, or illness-specific stress in order to maximize quality of life [29].

Given the prevalence of FOR in this sample and association with EWB, interventions to reduce FOR are needed, though have rarely been examined among ovarian cancer survivors. A study of 62 women with ovarian cancer, of whom 56.5% reported clinically elevated FOR, found that 75% rated high satisfaction with a booklet on FOR created for Ovarian Cancer Australia and 93% would recommend the booklet to others [31]. However, this intervention did not improve FOR severity scores at one week follow-up. These results suggest more intensive intervention is needed to effectively reduce FOR among ovarian cancer survivors. The effectiveness of cognitive behavioral therapy (CBT) interventions has been demonstrated through a systematic review and meta-analysis of 19 RCTs [32], with similar findings reported from a systematic review of 21 RCTs [33] among survivors of various types of cancer, predominantly breast cancer. An eHealth CBT-based intervention (FoRtitude) [34,35] has demonstrated promising results among breast cancer survivors with strong support for the feasibility of using web-based intervention delivery enhanced by telephone-delivered motivational interviewing [36]. Collectively, these results indicate the potential value of CBT-based interventions to reduce FOR among long-term ovarian cancer survivors warrants future investigation.

Limitations of this study include small numbers and limited power to detect statistically significant differences associated with recurrence. The study is also limited by a lack of data on current active treatment. Therefore, results may best be regarded as hypothesis generating. While QOL was consistently lower in long-term survivors with recurrent ovarian cancer compared to those with no recurrence, supporting the results of other studies, no differences reached statistical significance.

This research was done in English only, with predominantly Caucasian (94%) and highly educated long-term survivors who volunteered to participate in the study. These demographics, while similar to other studies [13,15], pose a possible limitation to the generalizability of our results. As there are disparities in treatment, survival and recruitment to studies, leading to under-representation of minorities and non-English-speaking women [37–39], it is possible that our participants may be healthier with higher QOL than the average ovarian cancer survivor. Further research with non-English speaking women and women of color is recommended to ensure these results apply more broadly.

There is no consensus on how to define FOR. Two systematic reviews of quantitative studies of FOR noted that it has been labeled and measured in >30 different ways, most of which lack psychometric data and have been used only in one or two studies [29,30]. In addition to many single-item measures, a few validated questionnaires exist including the Fear of Recurrence Questionnaire [40], Fear of Progression Questionnaire [41], the Concerns about Recurrence Scale [42], the Fear of Cancer Recurrence Inventory [43], and the Fear of Relapse/Recurrence Scale [44]. Lacking a validated scale with identified psychometric properties, we used a single-item measure to estimate fear of cancer recurrence. While this is a limitation of our analysis, the strong inverse association between EWB and FOR adds to the validity of our measure. The literature on FOR is severely hampered by a lack of consensus on how to best measure FOR and the absence of validated instruments with ties to clinically important levels [29]. Nevertheless, this is an important construct as it appears to negatively impact emotional well-being during long-term cancer survivorship.

5. Conclusion

In summary, QOL in long-term (>8 years) survivors of ovarian cancer, two-thirds of whom have recurrent disease, is high and, on average equal to or higher than QOL for healthy U.S. women. Overall QOL was lower for survivors with recurrent disease. Fear of recurrence was negatively associated with emotional well-being independent of overall QOL (TOI) and had a more significant negative effect on emotional distress in women with recurrent disease. There is need for better measurement of fear of cancer recurrence and interventions designed to moderate associated stress while encouraging positive health behavior changes.

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HIGHLIGHTS

- Fear of recurrence (FOR) is associated with lower quality of life (QOL) for ovarian cancer survivors.
- Little is known about the QOL of long-term ovarian cancer survivors and how FOR affects QOL.
- Long-term survivors of >8 years post diagnosis exhibited good QOL equal to or higher than the average for healthy U.S. women.
- Survivors with high FOR also had increased emotional distress, especially for those with recurrence.
- Attention to FOR measurements and interventions for FOR may improve QOL for long-term survivors of ovarian cancer.

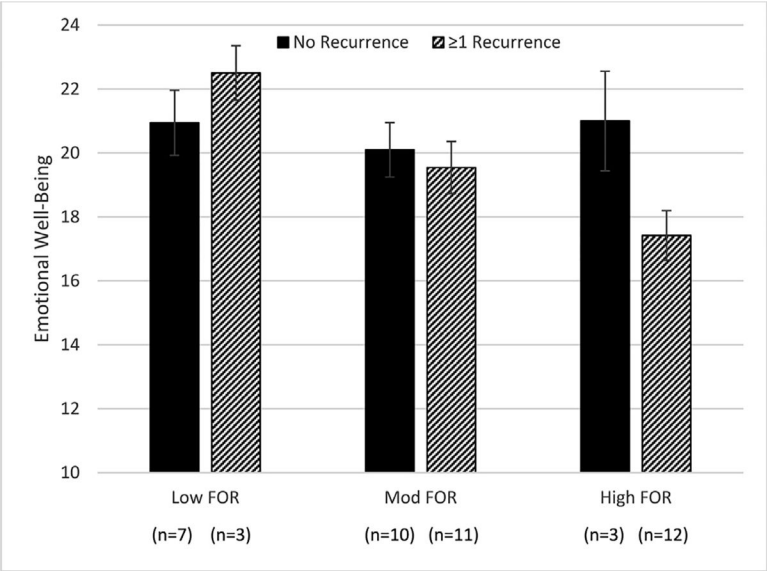

Fig. 1.

Emotional Well-Being (EWB) by Disease Recurrence and FOR (Low, Moderate, High). EWB decreased with increasing FOR in long-term survivors with recurrent disease. However, no trend was observed for EWB with increasing FOR in survivors without recurrence (interaction $p = 0.034$).

Table 1

Patient characteristics.

	N	Mean / %	SD
Age at Interview	58	65.2	9.1
Age at Diagnosis	58	52.8	9.5
Survival time (years from diagnosis)	58	13.5	5.0
Ethnicity			
Caucasian/Non-Hispanic	50	94.3	
African American	1	1.9	
Latina	1	1.9	
Asian	1	1.9	
unknown	5		
Education			
High School	4	7.3	
Some College	13	23.6	
College Graduate	7	12.7	
Some Graduate School	5	9.1	
Graduate/Professional Degree	26	47.3	
unknown	3		
Current Marital Status			
Single	5	9.1	
Married/living with partner	37	67.3	
Separated	1	1.8	
Divorced	5	9.1	
Widowed	7	12.7	
unknown	3		
Treatment			
Surgery	55	100	
Chemo	55	100	
unknown	3		
Recurrent Disease			
No	21	36.2	
Yes	37	63.8	

Table 2

QOL and lifestyle behaviors by disease recurrence.

	All			No Recurrence			≥1 Recurrence			t-test
	N	Mean	SD	N	Mean	SE	N	Mean	SE	p-value
Physical Well-Being	55	24.34	3.61	19	24.87	0.68	36	24.07	0.65	0.438
Social Well-Being	55	22.24	4.87	19	23.61	0.91	36	21.79	0.87	0.188
Emotional Well-Being	56	20.10	3.06	20	20.53	0.52	36	19.86	0.57	0.438
Functional Well-Being	56	23.33	3.95	20	24.36	0.90	36	22.76	0.64	0.148
Additional Concerns	56	37.90	4.58	20	39.00	0.97	36	37.28	0.78	0.181
FACT-G	56	90.73	11.60	20	94.26	2.28	36	88.77	2.00	0.090
FACT-O	56	128.63	14.83	20	133.25	2.82	36	126.06	2.59	0.082
FACT-O-TOI	56	85.92	10.20	20	89.11	1.88	36	84.14	1.80	0.080
Neurotoxicity	55	11.49	4.79	20	11.35	1.12	35	11.57	0.80	0.774
Abdominal Discomfort	55	14.42	2.35	20	15.10	0.25	35	14.03	0.47	0.104
Fatigue	54	11.50	3.61	20	12.70	0.64	34	10.79	0.66	0.060
									Chi-square	
		N	%	N	%	N	%		p-value	
FOR	Low	19	34.5	7	35.0	12	34.3		0.236	
	Med	21	38.2	10	50.0	11	31.3			
	High	15	27.3	3	15.0	12	34.3			
I am sleeping well	Low[a]	22	40.7	10	50.0	12	35.3		0.288	
	High[b]	32	59.3	10	50.0	22	64.7			
I am interested in sex	Low[a]	43	79.6	13	65.0	30	88.2		0.041	
	High[b]	11	20.4	7	35.0	4	11.8			
I am satisfied with my sex life	Low[a]	32	65.3	10	55.6	22	71.0		0.275	
	High[b]	17	34.7	8	44.4	9	29.0			
Do you exercise?	No	7	13.7	3	16.7	4	12.1		0.686	
	Yes	44	86.3	15	83.3	29	87.9			
Exercise frequency/wk	≤2 h	24	47.1	7	38.9	17	51.5		0.558	

		All			No Recurrence			≥1 Recurrence			t-test
		N	Mean	SD	N	Mean	SE	N	Mean	SE	p-value
	>2 h	27		52.9	11	61.1	16	48.5			
Diet changed since diagnosis?	No	21		48.8	11	68.8	10	37.0	0.044		
	Yes	22		51.2	5	31.3	17	63.0			

[a] Responses classified “Low” include “not at all”, “a little bit”, “somewhat”.

[b] Responses classified “High” include “quite a bit”, “very much”.

Table 3

QOL by FOR.

	Low FOR (0–3)			Moderate FOR (4–7)			High FOR (8–10)			F_{trend}
	N	**Mean**	**SE**	**N**	**Mean**	**SE**	**N**	**Mean**	**SE**	**p-value**
Physical Well-Being	17	25.85	0.84	20	23.22	0.77	15	24.67	0.89	0.338
Social Well-Being	16	23.37	1.18	21	21.33	1.03	15	23.79	1.22	0.801
Emotional Well-Being	17	21.86	0.67	21	19.81	0.61	15	18.13	0.72	<0.0005
Functional Well-Being	17	23.38	0.97	21	22.83	0.88	15	24.47	1.04	0.446
Additional Concerns	17	38.00	1.15	21	37.83	1.04	15	38.32	1.23	0.847
FACT-G	17	95.12	2.81	21	88.16	2.53	15	91.03	2.99	0.323
FACT-O	17	133.09	3.63	21	126.01	3.27	15	129.36	3.87	0.484
FACT-O-TOI	17	87.28	2.51	21	84.89	2.26	15	87.49	2.67	0.955
Neurotoxicity	17	11.53	1.19	21	11.05	1.08	15	12.33	1.27	0.647
Abdominal Discomfort	17	14.88	0.54	21	14.14	0.49	15	14.67	0.58	0.786
Fatigue (4-item)	16	12.69	0.86	21	10.43	0.75	15	12.20	0.89	0.695
		N	**%**	**N**	**%**	**N**	**%**	**p-value**		
Recurrent disease	No	7	36.8	10	47.6	3	20.0	0.236		
	Yes	12	63.2	11	52.4	12	80.0			
I am sleeping well	Low[a]	7	43.8	11	52.4	3	20.0	0.141		
	High[b]	9	56.3	10	47.6	12	80.0			
I am interested in sex	Low[a]	12	75.0	18	85.7	12	80.0	0.712		
	High[b]	4	25.0	3	14.3	3	20.0			
I am satisfied with my sex life	Low[a]	9	60.0	12	66.7	10	71.4	0.807		
	High[b]	6	40.0	6	33.3	4	28.6			
Do you exercise?	No	0	0.0	5	26.3	2	13.3	0.072		
	Yes	17	100.0	14	73.7	13	86.7			
Exercise hours/wk	≤2 h	9	60.0	9	47.4	4	26.7	0.066		
	>2 h	6	40.0	10	52.6	11	73.3			
Diet changed since diagnosis?	No	5	45.5	13	76.5	3	20.0	0.006		
	Yes	6	54.5	4	23.5	12	80.0			

[a]Responses classified “Low” include “not at all”, “a little bit”, “somewhat”.

[b]Responses classified “High” include “quite a bit”, “very much”.

Table 4

Multivariable linear model for emotional well-being.

Effect	Level	Model Effect Estimate	p-Value	Least Squares Mean EWB[a]	95% Confidence Interval	
					Lower	Upper
Constant		8.642				
FACT-O-TOI (continuous)		0.134	<0.001			
Recurrence (No (ref) vs Yes)	No	0.138	0.711	20.32	19.14	21.50
	Yes	−0.138		20.04	19.23	20.85
FOR (Low-Mod-High (ref))	Low	1.400	0.022	21.58	20.44	22.72
	Mod	−0.186		20.00	18.98	21.00
	High	−1.214		18.97	17.47	20.46
Recurrence x FOR (interaction)	No*Low	− 1.041	0.034	20.68	18.93	22.42
	No*Mod	− 0.453		19.68	18.21	21.15
	No*High	1.494		20.60	17.93	23.27
	Yes*Low	1.041		22.48	21.03	23.94
	Yes*Mod	0.453		20.31	18.87	21.75
	Yes*High	−1.494		17.33	16.00	18.66

Multiple $r = 0.7$.

[a]Least squares mean EWB adjusted for covariates, estimated at mean FACT-O-TOI.