Nurse-led exercise and cognitive-behavioral care against nurse-led usual care between and after chemotherapy cycles in Han Chinese women of ovarian cancer with moderate to severe levels of cancer-related fatigue

A retrospective analysis of the effectiveness

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Abstract

Women with ovarian cancer are reported to fatigue over time. Moderate to severe levels of cancer-related fatigue is fluent in Han Chinese patients with cancer. Comprehensive Cancer Network guidelines are recommending exercise and cognitive behavioral therapy to reduce cancer-related fatigue. Exercise is an easy, cost-effective, and non-pharmacological approach. The objective of the study was to evaluate the effectiveness of nurse-led exercise and cognitive-behavioral care against nurse-led usual care in Han Chinese women of ovarian cancer regarding cancer-related fatigue, depressive symptoms, and sleep quality.

Han Chinese women with moderate to severe levels of cancer-related fatigue have received 30 minutes, 5 times/week nurse-led exercise and 60 min/week cognitive-behavioral care (EC cohort, n = 118) or nurse-led usual care regarding educations and recommendations only (UC cohort, n = 126) or have not received nurse-led exercise, cognitive-behavioral care, educations, and recommendations (NC cohort, n = 145) between and after chemotherapy cycles. The Piper Fatigue Scale, the Zung Self-rating Depression Scale, and Pittsburgh Sleep Quality Index questionnaires were evaluated at the start and the end of non-pharmacological treatment.

At the end of treatment as compared to the start of treatment, only women of EC cohort had decrease Piper Fatigue Scale (5.40 ± 1.49/woman vs 6.06 ± 1.49/woman, P < .0001, q = 4.973) and Zung Self-rating Depression Scale score (48.67 ± 4.24/woman vs 49.93 ± 4.29/woman, P = .001, q = 3.449). Also, at the end of treatment, as compared to the start of treatment, only women of EC cohort have increased Pittsburgh Sleep Quality Index score (14.76 ± 2.18/woman vs 13.94 ± 2.90/woman, P = .045, q = 3.523). Only exercise and cognitive-behavioral care were successful in a decrease in the numbers of women with depression (the Mandarin Chinese version of the Zung Self-rating Depression Scale score >53, 32 vs 16, P = .015).

Nurse-led exercise and cognitive-behavioral care can help Han Chinese women with ovarian cancer to decrease cancer-related fatigue and depression. Also, it can improve the quality of sleep.

Evidence Level: 4.

Technical Efficacy: Stage 5.

Abbreviations: EC cohort = women have received nurse-lead exercise and cognitive-behavioral care in between and after chemotherapy cycles, NC cohort = women have not received nurse-lead exercise and cognitive-behavioral care or usual care in between and after chemotherapy cycles, UC cohort = women have received usual care in between and after chemotherapy cycles.

Keywords: cancer-related fatigue, cognitive-behavioral care, depression, exercise, Han Chinese women, ovarian cancer, sleep

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The datasets generated during and/or analyzed during the current study are not publicly available, but are available from the corresponding author on reasonable request.

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1. Introduction
Cancer-related fatigue is a general problem faced by patients suffering from cancer.\cite{31} Multiple symptoms of distress can persist for a long time even after the curative treatment has ended.\cite{2} Persistent subjective sense of physically, emotionally, and/or cognitive tiredness or exhaustion or a sensation of weakness due to cancer-related treatment is considered as cancer-related fatigue.\cite{3} Women with ovarian cancer are reported to fatigue over time and it is also reported as a pre-diagnostic symptom.\cite{4} Moderate to severe levels of cancer-related fatigue is fluent in Han Chinese patients with cancer.\cite{1}

Treatment for cancer-related fatigue is either pharmacological,\cite{5} psychostimulants, and non-pharmacological approach which includes cognitive behavioral therapy and exercises.\cite{6,7} Exercise is an easy, cost-effective, and non-pharmacological approach.\cite{8} Exercise has a significant effect on the reduction of cancer-related fatigue.\cite{9} A Cochrane database systematic review,\cite{10} randomized controlled trials,\cite{1,11,12,13} meta-analyses,\cite{8,12,13} and a pilot study\cite{14} reported that exercise and cognitive behavioral therapy are effective to reduce cancer-related fatigue, improve mood, and sleep functions among cancer patients. However, a randomized controlled trial\cite{15} is reported that home-based exercise intervention had no effect on fatigue and the other symptoms among women with breast, colorectal, or ovarian cancer. Comprehensive Cancer Network guidelines is recommending exercise and cognitive behavioral therapy to reduce cancer related fatigue.\cite{16} Clinical nurses have adequate knowledge and skill for management of cancer related fatigue among cancer treated patients.\cite{17}

The objective of the study was to evaluate the effectiveness of nurse-led exercise and cognitive-behavioral care against nurse-led usual care between and after chemotherapy cycles in Han Chinese women of ovarian cancer with moderate to severe levels of cancer-related fatigue regarding cancer-related fatigue, depressive symptoms, and sleep quality.

2. Materials and methods

2.1. Ethics approval and consent to participate
The designed protocol (SFPH_141521 dated February 10, 2020) was approved by the Shanghai Fourth People’s Hospital review board and the Chinese Nursing Association. The study adheres to the law of China and the v2008 Declarations of Helsinki. As being retrospective analysis, informed consent of women was not required.

2.2. Inclusion criteria
Han Chinese women with ovarian cancer and have moderate to severe levels of cancer-related fatigue (the Mandarin Chinese version of the Piper Fatigue Scale score ≥ 4)\cite{16} between and after chemotherapy cycles were included in the analysis.

2.3. Exclusion criteria
Non-Han Chinese women, women who had contraindications to exercise (suffering from osteoporosis, paralysis, spinal cord operations), history of cognitive disorders, and sleep disorders were excluded from the analysis.

2.4. Sample size calculation
The study assumed that nurse-led exercise and cognitive-behavioral care or usual care would decrease cancer-related fatigue at least 0.5 point.\cite{18} Based on this assumption, 5% type-I error, and 10% type-II error, the sample size (minimum women required in each cohort) was 100.

2.5. Cohorts
A total of 118 Han Chinese women have received nurse-led exercise and cognitive-behavioral care between and after chemotherapy cycles (EC cohort). A total of 126 Han Chinese women have received nurse-led usual care between and after chemotherapy cycles (UC cohort). A total of 145 Han Chinese women have not received nurse-led exercise and cognitive-behavioral care or usual care between and after chemotherapy cycles (NC cohort). Session of nurse-led exercise and cognitive-behavioral care or usual care was taking place at the hospital when women arrived for their chemotherapy cycle. The last session was taken place at the women’s home.

2.6. Nurse-led exercise
Muscle strength testing including aerobic and resistive activities were performed. The exercise was performed for 30 minutes and 5 times a week. Nursing staff (minimum postgraduate in nursing) were engaged in exercise.

2.7. Nurse-led cognitive-behavioral care
Women had received cognitive-behavioral care intervention 60 minutes per week. Cognitive-behavioral care specialist nurses with a minimum of 10 years of experience were engaged in cognitive-behavioral care intervention.

2.8. Usual care
Here women have received drug educations, diet recommendations, and education about ovarian cancer chemotherapy. Women have not received any type of intervention or exercise. Nursing staff (minimum postgraduate in nursing) were engaged in usual care.

2.9. Outcome measures
Questionnaires, cancer-related fatigue, depressive symptoms, and sleep quality measurements were evaluated between and after chemotherapy cycles.

2.10. Cancer-related fatigue
The Mandarin Chinese version of the Piper Fatigue Scale was used for the measurement of cancer-related fatigue. It consists of a self-rated 24-items (6 behavioral items, 6 cognitive fatigue items, 5 sensory items, 5 affective items, and 2 were specific items for Chinese territory) numeric scale. All women were asked to rate their symptoms on a 0 to 10 scale. 0: no symptom of fatigue, 1 to 3: a mild symptom of fatigue, 4 to 6: a moderate symptom of fatigue, and 7 to 10: a severe symptom of fatigue. Where 0 indicated absence and 10 indicated severely. The Cronbach α is 0.96 to 0.97.\cite{19}
2.11. Depressive symptoms

The Mandarin Chinese version of the Zung Self-rating Depression Scale was used to identify presence of depressive disorders/symptoms. It consists of self-rated 20-items and the level of depression was analog by a 4-point Likert scale. The Cronbach $\alpha$ is 0.94. The total score is 80 and a score greater than 53 was considered as depression.[20]

2.12. Quality of sleep

The Mandarin Chinese version of the Pittsburgh Sleep Quality Index questionnaires was used for the measurement of quality of sleep. It consists of self-rated 19-sleep-behavior questionnaires of 7 subdomains (sleep latency, subjective sleep quality, sleep duration, sleep efficiency, sleep dysfunction, sleeping medications, and daytime dysfunction). A 3-point Likert scale was used for the assessment of each question. The Cronbach $\alpha$ is 0.81 to 0.85. The score range was 0 to 21. The higher the score the higher would be quality of sleep.[21]

2.13. Adverse events

Data regarding any adverse event due to exercise, cognitive-behavioral care, or usual care were collected and analyzed.

2.14. Statistical analysis

SPSS 26.0 (IBM Corporation, Armonk, NY) was used for statistical analysis purposes. One-way analysis of variance between cohorts and repeated measures of analysis of variance within the cohort was performed for statistical analysis.[11] Tukey test (considering critical value ($q$) >3.327 as significant between cohorts and >3.330 as significant within the cohort) was performed for post hoc analysis. Fischer exact test or chi-square test of independence was used for categorical data. All results were considered significant if $P$ was less than .05.

3. Results

3.1. Study population

From October 15, 2017 to July 1, 2019, a total of 396 Han Chinese women with ovarian cancer and have moderate to severe levels of cancer-related fatigue, were taking chemotherapies at the department of oncology of the Shanghai Fourth People’s Hospital, Shanghai, China and the International Peace Maternity and Child Health Hospital, School of Medicine, Shanghai Jiao Tong University, Shanghai, China. Among them, 2 women were suffering from osteoporosis, 1 woman had paralysis, 1 woman had spinal cord operations, 2 women had a history of cognitive

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Figure 1. The flow diagram for management of cancer-related fatigue between and after chemotherapy cycles of Han Chinese women with ovarian cancer.
disorders, and 1 woman had sleep disorders. Therefore, data of a total of 7 women were excluded from the analysis. Data regarding questionnaires, cancer-related fatigue, depressive symptoms, and sleep quality between and after chemotherapy cycles of the total of 389 Han Chinese women were collected and analyzed. The flow diagram for management of cancer-related fatigue between and after chemotherapy cycles of Han Chinese women with ovarian cancer is reported in Figure 1.

### 3.2. Demographical and clinical conditions

At the start of non-pharmacological treatment for cancer-related fatigue, there were no significant differences for demographical characters, social parameters, clinical conditions, cancer-related fatigue, depressive symptoms, and quality of sleep of Han Chinese women among cohorts ($P > .05$ for all). The details of demographical, social, and clinical conditions of Han Chinese women at the start of non-pharmacological treatment for cancer-related fatigue are reported in Table 1.

At the start of non-pharmacological treatment, the numbers of Han Chinese women with depression (the Mandarin Chinese version of the Zung Self-rating Depression Scale score $> 53$) were 32 (27%), 25 (20%), and 28 (19%) among EC, UC, and NC cohorts, respectively. Cancer-related fatigue, depressive symptoms, and quality of sleep of Han Chinese women at the start of non-pharmacological treatment are reported in Table 2.

### 3.3. Piper Fatigue Scale

At the end of non-pharmacological treatment as compared to the condition of the start of non-pharmacological treatment, only women of the EC cohort had decrease Piper Fatigue Scale ($5.40 \pm 1.49$/woman vs $6.06 \pm 1.49$/woman, $P < .0001$, $q = 4.973$). However, women of UC ($P = .128$), and NC ($P = .071$) cohorts

| Parameters                      | EC                                      | UC                                      | NC                                      | Comparisons |
|---------------------------------|-----------------------------------------|-----------------------------------------|-----------------------------------------|-------------|
| Non-pharmacological treatment   | Exercise and cognitive-behavioral care   | Usual care                              | Nothing                                 |             |
| Numbers of women                | 118                                     | 126                                     | 145                                     | $P$ value   |
| Age (yrs)                       | Minimum                                 | Maximum                                 |                                         | .178        |
|                                 | 30                                      | 31                                      | 30                                      |             |
| Educational level               | Very primitive                          | School level                            | Graduate or more                        | .537        |
|                                 | 23 (19)                                 | 16 (13)                                 | 21 (15)                                 |             |
| Family caregivers               | Husband                                 | Other                                   |                                         | .551        |
|                                 | 85 (72)                                 | 91 (72)                                 | 97 (67)                                 |             |
| Marital status                  | Married                                 | Single                                  |                                         | .764        |
|                                 | 107 (91)                                | 111 (88)                                | 131 (90)                                |             |
| Smoking status                  | No smoker                               | Previous smoker                         | Current smoker                          | .913        |
|                                 | 103 (87)                                | 108 (86)                                | 125 (86)                                |             |
| Cancer stage                    | I                                       | II                                      | III                                     | .172        |
|                                 | 14 (12)                                 | 14 (11)                                 | 15 (10)                                 |             |
| Presence of 1 or more comorbidity | Yes                                    | No                                     |                                         | .799        |
|                                 | 93 (79)                                 | 95 (75)                                 | 113 (78)                                |             |
|                                 | 25 (21)                                 | 31 (23)                                 | 32 (22)                                 |             |

Continuous variables are demonstrated as mean ± standard deviation (SD) and constant variables are demonstrated as frequency (percentages). One-way ANOVA (for continuous variables) and chi-square test of independence (for constant variables) were used for statistical analyses. A $P < .05$ considered significant.

ANOVA = analysis of variance, EC cohort = women have received nurse-lead exercise and cognitive-behavioral care in between and after chemotherapy cycles, NC cohort = women have not received nurse-lead exercise and cognitive-behavioral care or usual care in between and after chemotherapy cycles, $P$ value = measure of the probability, UC cohort = women have received usual care in between and after chemotherapy cycles.
| Parameters | EC | UC | NC | At BL | At EL |
|------------|----|----|----|-------|-------|
| Non-pharmacological treatment | Exercise and cognitive-behavioral care | Usual care | Nothing |
| Numbers of women | 118 | 118 | 126 | 126 | 145 | 145 |
| The Mandarin Chinese version of the Piper Fatigue Scale score | | | | | | |
| Minimum | 4 | 4 | 4 | 4 | N/A | N/A |
| Maximum | 9 | 8 | 9 | 8 | .128 | .071 |
| Mean ± SD | 6.06 ± 1.49 | 5.40 ± 1.49 | 6.17 ± 1.64 | 5.80 ± 1.23 | 6.43 ± 1.42 | 6.39 ± 1.27 |
| The Mandarin Chinese version of the Zung Self-rating Depression Scale score | | | | | | |
| Minimum | 40 | 39 | 39 | 39 | 40 | 40 |
| Maximum | 57 | 56 | 56 | 55 | .371 | .379 |
| Mean ± SD | 49.93 ± 4.29 | 48.67 ± 4.24 | 50.60 ± 3.37 | 50.30 ± 3.32 | 50.01 ± 3.68 | 49.93 ± 3.57 |
| Numbers of women with depression (score >53) | 32 (27%) | 16 (14%) | 25 (20%) | 22 (17%) | 28 (19%) | 28 (19%) |
| The Mandarin Chinese version of the Pittsburgh Sleep Quality Index score | | | | | | |
| Minimum | 8 | 10 | 8 | 9 | 8 | 9 |
| Maximum | 18 | 9 | 18 | 18 | .381 | .743 |
| Mean ± SD | 13.94 ± 2.90 | 14.76 ± 2.18 | 14.29 ± 2.48 | 14.37 ± 2.33 | 13.70 ± 2.75 | 13.71 ± 2.72 |

Continuous variables are demonstrated as mean ± standard deviation (SD) and constant variables are demonstrated as frequency (percentages).
One-way ANOVA (for continuous variables) and chi-square test (for constant variables) were used for statistical analyses.
Tukey test was used for post hoc analysis.
A P < .05 and q > 3.327 (between cohorts) and >3.330 (within the cohort) considered significant.
ANOVA = analysis of variance, BL = at the start of non-pharmacological treatment, EC cohort = women have received nurse-lead exercise and cognitive-behavioral care in between and after chemotherapy cycles, EL = at the end of non-pharmacological treatment, N/A = not applicable, NC cohort = women have not received nurse-lead exercise and cognitive-behavioral care or usual care in between and after chemotherapy cycles, P value = measure of the probability, q = critical value for Tukey test, UC cohort = women have received usual care in between and after chemotherapy cycles.
have not decreased Piper Fatigue Scale. At the end of non-pharmacological treatment Piper Fatigue Scale of women of EC cohort had fewer than those of UC (\(P < .0001, q = 3.642\)) and NC (\(P < .0001, q = 9.219\)) cohorts. Also, at the end of non-pharmacological treatment, the Piper Fatigue Scale of women of the UC cohort was fewer than those of the NC cohort (\(P < .0001, q = 5.554\)). The details of the Piper Fatigue Scale of women are reported in Figure 2.

### 3.4. Zung Self-rating Depression Scale

At the end of non-pharmacological treatment as compared to the condition of the start of non-pharmacological treatment, only women of the EC cohort had decrease Zung Self-rating Depression Scale score (48.67 ± 4.24/woman vs 49.93 ± 4.29/woman, \(P = .001, q = 3.449\)). However, women of UC (\(P = .371\)) and NC (\(P = .979\)) cohorts have not decreased Zung Self-rating Depression Scale score. At the end of non-pharmacological treatment Zung Self-rating Depression Scale score of women of EC cohort had fewer than those of UC (\(P = .002, q = 4.852\)) and NC (\(P = .002, q = 3.875\)) cohorts. At the end of non-pharmacological treatment Zung Self-rating Depression Scale score of women of EC cohort had fewer than those of UC (\(P = .001, q = 3.449\)). However, women of UC (\(P = .371\)) and NC (\(P = .979\)) cohorts have not increased Pittsburgh Sleep Quality Index score. At the end of non-pharmacological treatment, the Pittsburgh Sleep Quality Index score of women of the EC cohort was higher than those of the NC cohort (\(P = .002, q = 4.889\)). The details of the Zung Self-rating Depression Scale score are presented in Figure 4.

### 3.5. Pittsburgh Sleep Quality Index

At the end of non-pharmacological treatment as compared to the condition of the start of non-pharmacological treatment, only women of the EC cohort have increased Pittsburgh Sleep Quality Index score (14.76 ± 2.18/woman vs 13.94 ± 2.90/woman, \(P = .045, q = 3.523\)). However, women of UC (\(P = .381\)) and NC (\(P = .743\)) cohorts have not increased Pittsburgh Sleep Quality Index score. At the end of non-pharmacological treatment, the Pittsburgh Sleep Quality Index score of women of the EC cohort was higher than those of the NC cohort (\(P = .002, q = 4.889\)). The details of the Pittsburgh Sleep Quality Index score are presented in Figure 5.

### 3.6. Adverse events

No adverse events due to exercise, cognitive-behavioral care, or usual care were reported.

### 4. Discussion

Han Chinese women who received nurse-led exercise and cognitive-behavioral care have less cancer-related fatigue than those who have received nurse-led usual care or who did not receive nurse-led exercise and cognitive-behavioral care or usual care. The results of the Mandarin Chinese version of the Piper Fatigue Scale score of the current study are consistent with those of a randomized trial\[1\] a pilot study\[14\] a Cochrane database Systematic Review\[10\] and meta-analyses\[8,9,12,13\] but not consistent with a randomized controlled trial\[15\] A randomized trial\[11\] and a pilot study\[14\] both are performed
with a small sample size. The possible justification for the contradictory results is different inclusion criteria between both studies and a randomized controlled trial\cite{15} has used home-based exercise intervention. While the current study had used nurse-lead exercise and cognitive-behavioral care and nurse-lead usual care at the institutes. Nurse-led intervention(s) has more effect than those of home-based.\cite{1}

Nurse-led exercise and cognitive-behavioral care can help Han Chinese women with ovarian cancer to decrease cancer-related fatigue.

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**Figure 3.** The numbers of women with depression. A score greater than 53 was considered as depression. EC cohort = women have received nurse-lead exercise and cognitive-behavioral care in between and after chemotherapy cycles, NC cohort = women have not received nurse-lead exercise and cognitive-behavioral care or usual care in between and after chemotherapy cycles, UC cohort = women have received usual care in between and after chemotherapy cycles.

**Figure 4.** Depressive symptoms evaluation at different time points. The Mandarin Chinese version of the Zung Self-rating Depression Scale score. The total score is 80 and a score greater than 53 was considered as depression. EC cohort = women have received nurse-lead exercise and cognitive-behavioral care in between and after chemotherapy cycles, NC cohort = women have not received nurse-lead exercise and cognitive-behavioral care or usual care in between and after chemotherapy cycles, UC cohort = women have received usual care in between and after chemotherapy cycles.
Han Chinese women who received nurse-led exercise and cognitive-behavioral care have fewer depressive symptoms than those who have received nurse-led usual care or who did not receive nurse-led exercise and cognitive-behavioral care or usual care. The results of the Mandarin Chinese version of the Zung Self-rating Depression Scale score of the current study are consistent with those of a randomized trial,[1] a pilot study,[14] and meta-analyses[8,9,12,13] but not consistent with a randomized controlled trial.[15] Nurse-led cognitive-behavioral care can help Han Chinese women with ovarian cancer to generate hope about their life.

Han Chinese women who received nurse-led exercise and cognitive-behavioral care have a higher quality of sleep than those who have received nurse-led usual care or who did not receive nurse-led exercise and cognitive-behavioral care or usual care. The results of the Mandarin Chinese version of the Pittsburgh Sleep Quality Index questionnaires of the current study are consistent with those of a randomized trial[1] but not consistent with a randomized controlled trial.[15] Reduction of depression of women leads to improvement of quality of sleep.[22] Nurse-led exercise and cognitive-behavioral care can provide better sleep to Han Chinese women with ovarian cancer.

In the limitations of the study, for example, retrospective analysis and lack of randomized trial. The study only includes Han Chinese women with ovarian cancer. Only short-term effects were evaluated, long-term effects of exercise and cognitive-behavioral care, and usual care were not discussed. The other limitations are that the results were self-reported data, which are less accurate than objective parameters. The possible justification is that cancer-related fatigue, depression, and poor quality of sleep are subjective parameters and are not objective parameters.[1] Self-reported data does have value in that it takes into account the women’s experience, and it should be appreciated, in no way less accurate than objective parameters which may not reflect the day-to-day functioning of activities. The effects differ by advanced cancer staging is not discussed.

5. Conclusions
Nurse-led exercise and cognitive-behavioral care can help to decrease cancer-related fatigue and depression among Han Chinese women with ovarian cancer and have moderate to severe levels of cancer-related fatigue. Also, it can improve the quality of sleep. The study data provide background for the solution of ovarian cancer-related problems in women in different regions. Also, focused on implementation of the nurse-led exercise and cognitive-behavioral care intervention into practice.

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References
[1] Zhang Q, Li F, Zhang H, Yu X, Cong Y. Effects of nurse-led home-based exercise & cognitive behavioral therapy on reducing cancer-related fatigue in patients with ovarian cancer during and after chemotherapy: a randomized controlled trial. Int J Nurs Stud 2018;78:52–60.
[2] Hornbein M, Fischer I, Dimeo F, Rüffer JU, Weis J. Cancer-related fatigue: epidemiology, pathogenesis, diagnosis, and treatment. Dtsch Arztebl Int 2012;109:161–71.
[3] Williams LA, Bohac C, Hunter S, Cella D. Patient and health care provider perceptions of cancer-related fatigue and pain. Support Care Cancer 2016;24:4357–63.
[4] Shinde S, Wanger T, Novotny P, Grudem M, Jatoi A. Disease-free ovarian cancer patients report severe pain and fatigue over time:
prospective quality of life assessment in a consecutive series. Eur J Gynaecol Oncol 2015;36:155–60.
[5] Qu D, Zhang Z, Yu X, Zhao J, Qi F, Huang J. Psychotropic drugs for the management of cancer-related fatigue: a systematic review and meta-analysis. Eur J Cancer Care 2016;25:970–9.
[6] Modlińska A, Kowalki B, Buss T, Janiszewska J, Lichodziejewska-Niemierko M. Strategy of coping with end-stage disease and cancer-related fatigue in terminal ill patients. Am J Hosp Palliat Care 2014;31:771–6.
[7] Pearson EJM, Morris ME, di Stefano M, McKinstry CE. Interventions for cancer-related fatigue: a scoping review. Eur J Cancer Care 2018;27:1–14.
[8] Tomlinson D, Diorio C, Beyene J, Sung L. Effect of exercise on cancer-related fatigue: a meta-analysis. Am J Phys Med Rehabil 2014;93:675–86.
[9] Tian L, Lu HJ, Lin L, Hu Y. Effects of aerobic exercise on cancer-related fatigue: a meta-analysis of randomized controlled trials. Support Care Cancer 2016;24:969–83.
[10] Cramp F, Byron-Daniel J. Exercise for the management of cancer-related fatigue in adults. Database Syst Rev 2012;1:97.
[11] Goedendorp MM, Knoop H, Gielissen MF, Verhagen CA, Bleijenberg G. The effects of cognitive behavioral therapy for postcancer fatigue on perceived cognitive disabilities and neuropsychological test performance. J Pain Symptom Manage 2014;47:35–44.
[12] McMillan EM, Newhouse IJ. Exercise is an effective treatment modality for reducing cancer-related fatigue and improving physical capacity in cancer patients and survivors: a meta-analysis. Appl Physiol Nutr Metab 2011;36:892–903.
[13] Zou LY, Yang L, He XL, Sun M, Xu JJ. Effects of aerobic exercise on cancer-related fatigue in breast cancer patients receiving chemotherapy: a meta-analysis. Tumour Biol 2014;35:5659–67.
[14] Moonsammy SH, Guglietti CL, Santa Mina D, et al. A pilot study of an exercise & cognitive behavioral therapy intervention for epithelial ovarian cancer patients. J Ovarian Res 2013;6:1–9.
[15] Dodd MJ, Cho MH, Miaskowski C, Painter PL, et al. A randomized controlled trial of home-based exercise for cancer-related fatigue in women during and after chemotherapy with or without radiation therapy. Cancer Nurs 2010;33:245–57.
[16] National Comprehensive Cancer Network. NCCN Clinical Practice Guidelines in Oncology: Cancer-related fatigue [v.1.2016]. 2016. Available at: http://www.nccn.org/professionals/physician_gls/pdf/fatigue.pdf. Accessed on 05/18/2021.
[17] McGowan K. Physical exercise and cancer-related fatigue in hospitalized patients: role of the clinical nurse leader in implementation of interventions. Clin J Oncol Nurs 2016;20:E20–7.
[18] Fong DY, Ho JW, Hui BP, et al. Physical activity for cancer survivors: meta-analysis of randomised controlled trials. BMJ 2012;344:1–14.
[19] Song Z, Sun LY, Gu SS, et al. Exploring the safety, effectiveness, and cost-effectiveness of a Chinese patent medicine (Fufang Ejiao syrup) for alleviating cancer-related fatigue: a protocol for a randomized, double-blind, placebo-controlled, multicenter trial. Integr Cancer Ther 2021;20:1–11.
[20] Lei M, Li C, Xiao X, Qu J, Dai Y, Zhang Q. Evaluation of the psychometric properties of the Chinese version of the Resilience Scale in Wenchuan earthquake survivors. Compr Psychiatry 2012;53:616–22.
[21] Lu T, Li S, Ma Y, et al. Positive correlation between tinnitus severity and poor sleep quality prior to tinnitus onset: a retrospective study. Psychiatr Q 2020;91:379–88.
[22] Jim HS, Small B, Faul LA, Franzen J, Apte S, Jacobsen PB. Fatigue, depression, sleep, and activity during chemotherapy: daily and intraday variation and relationships among symptom changes. Ann Behav Med 2011;42:321–33.