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Original Article

A correlation study of fear of cancer recurrence, illness representation, self-regulation, and quality of life among gynecologic cancer survivors in Taiwan

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ABSTRACT

Objective: The purpose of this study was to examine the correlations among fear of cancer recurrence (FCR), illness representation (IR), self-regulation (SR), and quality of life (QOL) in gynecologic cancer survivors.**Materials and methods:** A cross-sectional study was conducted with 287 participants recruited from a medical center in northern Taiwan. Four questionnaires, the Assessment of Survivor Concerns (ASC), the Brief Illness Perception Questionnaire (BIPQ), the Self-Regulation Questionnaire (SRQ), and the European Organization for Research and Treatment of Cancer's Quality-of-Life Questionnaire-Core 30-item (EORTC QLQ-C30), were used to assess FCR, IR, SR, and QOL respectively. Data pertaining to socio-demographic characteristics and self-reported medical status was also collected from the participants. Stepwise regression analysis was performed to identify predictors of QOL.**Results:** The results showed that FCR ($r = -.21$, $P < .01$) and IR ($r = -.44$, $P < .01$) was negatively correlated with global QOL subscale of the EORTC QLQ-C30. SR, IR, and health status in the self-reported medical status explained 39% of the variance in global QOL, with SR of the largest.**Conclusions:** Our findings provided valuable information to healthcare professionals about the ability of SR to affect QOL and negative impacts of FCR and IR on gynecologic cancer survivors.© 2018 Taiwan Association of Obstetrics & Gynecology. Publishing services by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Introduction

Women with gynecologic cancer increasingly live beyond the acute survival phase and achieve the permanent survival phase.

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However, they often face with treatment-induced side-effects, complications, and cumulative organ toxicities. These can alter body functioning, severely interfere with daily activities, and negative impact on the quality of life (QOL) [1,2]. Gynecologic cancer survivors, especially in Chinese society, may continue to shoulder the burden of being the family caregiver. They may also experience psychological distress from fear of cancer recurrence (FCR) and from being affected in the reproductive system. The intimate nature of gynecologic cancers may discourage survivors from seeking help for their problems, which would further affect the women's physical and psychological well-being [3–5].

Socio-demographic factors and medical status, including well-being at physical, psychological, social, spiritual levels, were associated with various multidimensional QOL models [6,7]. Several researches indicated that QOL was related to education level and

age [8,9]. Religion and social support, which are positively correlated with QOL, play a significant role between cancer survivors helping them enhance the mentality and living adaptation [10–12]. Medical status has also been correlated with QOL in gynecologic cancer survivors. Most of long-term cervical cancer survivors were found to be in good health and no different from healthy women in QOL [13–15]. Locally advanced cervical cancer patients scored lower in the cognitive functioning than early-stage patients [16]. Ovarian cancer survivors more than 3 years after diagnosis did not exhibit cancer stage–related differences in QOL, but some survivors were still affected by post-traumatic stress disorder, sexual problems, and FCR [17,18]. Furthermore, the complexity of treatment could cause physical and social well-being problems to cancer survivors [8,19–21].

FCR is the most universal and distressing response to surviving cancer, occurrence rate 22%–99% among cancer survivors [22]. Studies showed FCR to be negatively correlated with QOL and to be a predictor of mental status and emotional distress in cancer survivors [5,23,24]. FCR was also correlated with QOL in a nationwide survey study involving 455 cancer survivors at 2 years post-diagnosis [23]. Conceptually illness representation (IR) is defined as a cognitive and emotional representation of the illness, which is generated within oneself including beliefs and expectations toward the illness while facing with illness; to cope with the situation, patients would employ strategies of self-regulation (SR) to achieve mental and physical well-being [25]. Grossarth-Maticek defines SR as the ability to satisfy one's own needs and to achieve physical, psychological, and spiritual well-being through one's own actions and can be viewed a problem-solving capacity and an active adaptation to stressful situations in order to restore well-being [26,27]. Studies have associated IR and SR with psychological distress and QOL [28,29].

The psychological distress of gynecologic cancer survivors causing by FCR and IR could persist and last five to ten years. Recent researches on the recovery of gynecologic cancer survivors emphasized on QOL as an important indicator of physical and psychological conditions. SR could hold the key to improve QOL and enhance mental and physical balance of these survivors. Hence, this study was aimed to examine the relationships in FCR, IR, SR, and QOL and the effects of FCR, IR, and SR on QOL among gynecologic cancer survivors hoping to better understand the structures and problems faced by these survivors, thus enhancing their QOL.

Materials and methods

Study design, setting and sampling

A cross-sectional study was conducted at a medical center in northern Taiwan. Outpatients of gynecologic oncology, who were referred by doctors and had met the sampling criteria were recruited. The criteria for inclusion were age ≥ 20 years, diagnosis of cervical cancer, endometrial cancer, or ovarian cancer by a clinical specialist, and completion of the first treatment session. The criteria for exclusion were the presence of cognitive or communication impairments, diagnosis of two or more cancers, and prior diagnosis of psychiatric disorders.

For the estimation of effective sample size, G-POWER 3.1 was used. For a total of 921 cancer survivors of endometrial, cervical, and ovarian cancer from the medical center during the study period, the computed effective sample size with 95% confidence interval required larger than 276. For the present research, 290 patients approached and 287 valid questionnaires returned (3 invalid due to the restriction of time and travel). The response rate was greater than 99%.

Ethics statement

Ethical approval for the present study was obtained from the Institutional Review Board (13MMHIS035). Informed consents were provided to all subjects with written information about the purpose of the research and that participation of the research was voluntary and confidential.

Measurements and instruments

Several scales were used in data collection of the present research: Socio-demographic and medical status, Assessment of Survivor Concerns (ASC) questionnaire, Brief Illness Perception Questionnaire (BIPQ) for illness representation, Self-Regulation Questionnaire (SRQ), European Organization for Research and Treatment of Cancer Core Quality of Life Questionnaire-Core 30-item (EORTC QLQ-C30) Taiwan Chinese version.

Socio-demographic and medical status. Socio-demographic status included age, employment status, marital status, education, religion, support group participation, group support, family support, and chronic diseases. The age attribute was further categorized into three levels: ≤ 50 years; 50–60 years; ≥ 60 years. Employment status, marital status, religion, support group participation, and chronic diseases were dichotomous attributes whereas education, group support, and family support were trichotomous; for instance, the group support and the family support were both in 3 different categories (not, moderate, and sufficient support). The attributes of socio-demographic status were self-rated. Medical status included type of gynecologic cancer, cancer stage, survival time, treatment method, illness severity, health status, and sleep quality. All attributes in the medical status were trichotomous except for the treatment method, which was categorized into four levels (surgery only and 3 combinations of surgery, namely surgery plus radiation, surgery plus chemotherapy, and surgery plus radiation plus chemotherapy). Survival time was further categorized by: ≤ 2 years, 2–5 years, ≥ 5 years. Like socio-demographic status, the attributes of medical status were self-rated.

ASC questionnaire. The original 6-item ASC was developed by Gotay and Pagano [30] and comprises 2 subscales, *cancer worry* and *health worry*. The authors excluded the sixth item on the ASC, *I worry about my children's health*, resulting in a revised 5-item ASC that showed excellent internal consistency and validity. In the present study, we kept the excluded sixth item in the ASC because of cultural considerations for strong family ethics and filial piety. By expert advice, we modified the item to: *I worry about my family's (parents' or children's) health*. The Chinese version of the ASC was prepared through forward and backward translation with user feedback with construct validity and reliability: Cronbach's α equal to .91 and test-retest reliability coefficients .82.

BIPQ for illness representation. The BIPQ was developed by Broadbent, Petrie, Main, and Weinman [31] and has a Chinese version (<http://www.uib.no/ipq>). The scale consists of 9 items: 5 items on cognitive representation, 2 items on emotional representation, one item on illness comprehensibility, and one open-ended question about the causes of the illness. The third, fourth, and seventh items are scored reversely. The first 8 items are scored on an 11-point scale from 0 to 10 and summed to obtain the overall score of negative illness representation. Psychometric studies showed the BIPQ of good construct validity and reliability: Cronbach's α per item between .73 and .82; 3-week and 6-week test-retest reliability coefficients between .48–.70 and .42–.73 respectively [31].

SRQ. The revised 16-item SRQ was developed by Grossarth-Maticek et al. [26] and was shown by Bussing et al. [27] the psychometric properties to possess good validity and reliability.

The SRQ has been shown to be an effective instrument for measuring self-regulation in cancer patients [32,33]. The Taiwan Chinese version of the SRQ was adapted from the original German version through forward and backward translation with user feedback and has demonstrated good construct validity and reliability, with Cronbach's α equal .91 and test-retest reliability coefficient of .82.

EORTC QLQ-C30 Taiwan Chinese version. The EORTC QLQ-C30 contains a total of 30 items covering: 5 functional groups, including physical functioning, role functioning, emotional functioning, cognitive functioning, and social functioning, in 15 items; 3 symptom groups, including fatigue, pain, and nausea/vomiting, in 7 items; a global health status/QOL scale in 2 items; and, 6 single-item symptoms, including dyspnoea, insomnia, appetite loss, constipation, diarrhea, and financial difficulties, each with one item. The items in the EORTC QLQ-C30 are Likert scales organized into conceptual groups representing different domains of QOL. Scores are computed by summing the item scores for each domain and translating the raw domain total into a 100-point scale. A higher score would indicate better functioning in a particular domain, higher QOL, or more severe symptoms, whereas a lower score would indicate poorer functioning, lower QOL, or mild symptoms. The EORTC QLQ-C30 has demonstrated excellent psychometric properties [19,20,34].

Throughout the present study, we specified, if without special mention, the health status as the self-reported health status in the socio-demographic and medical status; likewise, we used the global QOL to stand for the global health status/QOL subscale of the EORTC QLQ-C30.

Data analyses

IBM SPSS ver. 19.0 was used in data analysis. Descriptive statistics were calculated for the distribution of variables in the sample (counts, percentages, means, standard deviations, and normality in terms of kurtosis and skewness). Levene's test for homogeneity of variance was used to assess the equality of variances between two or more groups of data. Univariate analysis was performed by two-tailed *t*-testing and one-way ANOVA to examine the significance of differences in a dependent variable in relation to each background independent variable, with the α level set at .05, followed by post hoc analysis in the case of a significant difference. The correlation between two variables was examined using Pearson's product-moment correlation. Construct validity was evaluated by confirmatory factor analysis, and internal consistency reliability was tested with Cronbach's α coefficient. Multivariate statistical analysis was performed by stepwise regression to construct a predictive model for the effects of variables, including socio-demographic and medical status variables, FCR, IR, and SR, on QOL.

Results

Socio-demographic and medical status of participants

The socio-demographic and medical status of the study participants were summarized in Table 1 and Table 2. A total of 287 patients aged 22–84 years participated in this study. The participants had a mean age of 54.02 ± 10.65 years, with the largest proportion aged 51–60 years (39.4%). Among the participants, 44.9% were employed; most were married (65.9%) and held religious beliefs (77.4%); most had education level of junior high school or less (40.8%); and 41.5% had chronic diseases. Over 30% of the participants were in support groups, of whom 61.3% reported sufficient group support, and a large majority of all participants indicated

receiving sufficient family support (85.7%). The mean survival time was 6.22 ± 5.60 years, with ≥ 5 years being the most common (46.7%).

Among the types of gynecologic cancer diagnosed in the participants, cervical cancer was the most common (42.9%), followed by endometrial cancer (28.9%) and ovarian cancer (28.2%). Most of the cancer cases were stage I (66.5%), followed by stage II (19.3%). Treatment was most commonly surgery (42.9%), followed by surgery plus chemotherapy (28.9%) and surgery plus radiation therapy (14.6%), with the least common treatment method being combined surgery, radiation therapy, and chemotherapy (13.6%). The largest number of participants had a moderate level of illness severity (44.2%), a good health status (51.9%) and an average level of sleep quality (42.2%).

Mean scores on FCR, IR, SR, and QOL

The scores on the scales and subscales of ASC, BIPQ, SRQ, and EORTC QLQ-C30 were summarized in Table 3. On FCR, the mean total score was 12.84 ± 4.53 , indicating that the participants experienced FCR. The mean scores of the 2 subscales, both ranging from 3 to 12, were 6.57 ± 2.33 for the *health worry* subscale and 6.27 ± 2.46 for the *cancer worry* subscale. On IR, the mean score was 29.31 ± 13.68 , ranging from 0 to 66. On SR, the scores for the total scale averaged 70.13 ± 13.23 and ranged from 23 to 129, indicating overall strong self-regulation. Of the 2 subscales, *achievement of satisfaction and well-being* had a mean score of 35.83 ± 7.23 with a range of 12–91, and *ability to change behavior in order to reach goals* had a mean score of 34.29 ± 6.82 with a range of 9–48.

As shown in Table 3, the mean score on global QOL was 70.21 ± 20.59 . The functional group with the highest mean score was role functioning, 94.46 ± 14.01 , followed by physical functioning, 86.46 ± 13.96 , with cognitive functioning having the lowest mean score, 77.53 ± 19.79 . Among the symptom groups, fatigue had the highest mean score, followed by pain and nausea/vomiting. The single-item symptoms, from the highest scoring to the lowest, were insomnia, constipation, diarrhea, financial impact, dyspnea, and appetite loss.

Effect of socio-demographic and medical status on global QOL

In Tables 1 and 2, global QOL was correlated with age ($F = 4.86$, $P = .008$), family support ($F = 8.99$, $P < .001$), illness severity ($F = 9.02$, $P < .001$), health status ($F = 38.26$, $P < .001$), and sleep quality ($F = 16.10$, $P < .001$). The mean global QOL score was higher for the ≥ 61 age group vs. the ≤ 50 age group, sufficient family support vs. moderate or no family support, mild illness vs. moderate or severe illness, good health status vs. average or poor health status, and good sleep quality vs. average or poor sleep quality.

With respect to the functional group subscales, factors that correlated with physical functioning included age ($F = 6.86$, $P = .001$), employment status ($t = -2.52$, $P = .012$), support group participation ($F = 2.06$, $P = .041$), chronic diseases ($t = 3.84$, $P < .001$), treatment method ($F = 4.516$, $P = .004$), health status ($F = 23.31$, $P < .001$), and sleep quality ($F = 10.07$, $P < .001$). Correlated with role functioning were family support ($F = 4.21$, $P = .016$), illness severity ($F = 5.92$, $P = .003$), health status ($F = 6.20$, $P = .002$), and sleep quality ($F = 4.86$, $P = .008$). Family support ($F = 5.62$, $P = .004$), health status ($F = 6.20$, $P = .002$), and sleep quality ($F = 4.86$, $P = .008$) were correlated with cognitive functioning. Factors that correlated with emotional functioning included group support level ($F = 3.52$, $P = .034$), family support ($F = 6.46$, $P = .002$), illness severity ($F = 4.58$, $P < .001$), health status ($F = 9.09$, $P < .001$), and sleep quality ($F = 13.89$, $P < .001$).

Table 1
Socio-demographic characteristics and global QOL variation among participants (*N* = 287).

Variable	No. of participants (%)	Global QOL mean (SD)	t/F value	<i>P</i> value	Post hoc comparisons
Age [§]			4.86	.008**	≥61 years > ≤50 years
≤50 years	100 (34.8)	65.42 (19.94)			
51–60 years	113 (39.4)	71.46 (22.07)			
≥61 years	74 (25.8)	74.77 (17.88)			
Employment status [†]			1.82	.069	
Not employed	158 (55.1)	72.2 (18.35)			
Employed	129 (44.9)	67.76 (22.88)			
Marital status [†]			−.94	.348	
No	98 (34.1)	68.62 (21.37)			
Yes	189 (65.9)	71.03 (20.19)			
Education [§]			1.56	.213	
Junior high school or less	117 (40.8)	71.37 (21.20)			
High school or vocational school	87 (30.3)	71.84 (21.24)			
Some college or more	83 (28.9)	66.87 (18.81)			
Religion [†]			.55	.583	
No	65 (22.6)	68.97 (20.65)			
Yes	222 (77.4)	70.57 (20.60)			
Support group participation [†]			−.95	.341	
No	199 (69.3)	70.98 (20.58)			
Yes	88 (30.7)	68.47 (20.63)			
Group support [§] &			1.74	.181	
No support	16 (18.2)	59.90 (22.61)			
Moderate support	18 (20.5)	69.44 (19.39)			
Sufficient support	54 (61.4)	70.68 (20.14)			
Family support [§]			8.99	<.001***	1. Sufficient > no support 2. Sufficient > moderate support
No support	16 (5.6)	58.33 (25.82)			
Moderate support	25 (8.7)	57.67 (19.93)			
Sufficient support	246 (85.7)	72.26 (19.74)			
Chronic diseases [†]			−1.58	.114	
No	168 (58.5)	71.83 (20.00)			
Yes	119 (41.5)	67.93 (21.28)			

† *t*-test; § one-way ANOVA; * *p* < .05; ** *p* < .01; *** *p* < .001; & for study participants with past or current support group participation.

Table 2
Medical status and global QOL variation among participants (*N* = 287).

Variables	No. of participants (%)	Global QOL mean (SD)	t/F value	<i>P</i> value	Post hoc comparisons
Type of gynecologic cancer [§]			.39	.681	
Cervical cancer	123 (42.9)	71.00 (19.97)			
Endometrial cancer	83 (28.9)	70.68 (21.52)			
Ovarian cancer	81 (28.2)	68.52 (20.71)			
Stage of gynecologic cancer ^{§a}			.23	.792	
Stage 1	183 (63.8)	70.45 (20.50)			
Stage 2	53 (18.5)	69.97 (22.01)			
Stage 3 and stage 4	39 (13.6)	67.95 (19.92)			
Survival time ^{§b}			.38	.685	
≤2 years	73 (25.4)	69.29 (18.00)			
2.01–4.99 years	79 (27.5)	72.05 (21.52)			
≥5 years	133 (46.3)	70.05 (21.27)			
Treatment method [§]			1.54	.206	
Surgery only	123 (42.9)	71.95 (19.80)			
Surgery + radiation	42 (14.6)	70.63 (22.26)			
Surgery + chemotherapy	83 (28.9)	70.38 (20.79)			
Surgery + radiation + chemotherapy	39 (13.6)	63.89 (20.35)			
Severity of illness ^{§b}			9.02	<.001***	1. Mild > Moderate 2. Mild > Severe
Severe	85 (29.6)	66.18 (21.91)			
Moderate	126 (43.9)	67.72 (19.61)			
Mild	74 (25.8)	78.49 (18.35)			
Health status [§]			38.26	<.001***	1. Good > Poor 2. Good > Average
Poor	26 (9.1)	53.53 (21.11)			
Average	112 (39.0)	62.35 (19.44)			
Good	149 (51.9)	79.03 (16.94)			
Sleep quality [§]			16.11	<.001***	Good > Average > Poor
Poor	59 (20.6)	59.75 (20.94)			
Average	121 (42.2)	68.87 (19.00)			
Good	107 (37.3)	77.49 (19.47)			

† *t*-test; § one-way ANOVA; * *p* < .05; ** *p* < .01; *** *p* < .001; ^a data missing for 12 participants; ^b data missing for 2 participants; ^c data missing for 1 participant.

Correlated with social functioning were education ($F = 3.30$, $P = .038$), support group participation ($t = 2.89$, $P = .004$), group support level ($F = 4.78$, $P = .011$), family support ($F = 7.86$, $P < .001$),

gynecologic cancer type ($F = 3.79$, $P = .024$), treatment method ($F = 8.28$, $P < .001$), health status ($F = 8.98$, $P < .001$), and sleep quality ($F = 7.97$, $P < .001$).

Table 3
Scores of ASC, BIPQ, SRQ, and EORTC QLQ-C30 (*N* = 287).

Scale/subscale	Mean	SD	Max	Min
ASC				
Total	12.84	4.53	24	6
Health worry	6.57	2.33	12	3
Cancer worry	6.27	2.46	12	3
BIPQ				
Total	29.31	13.68	66	00
SRQ				
Total	70.13	13.23	129	23
Achieve satisfaction and well-being	35.13	6.62	48	9
Ability to change behavior	34.98	7.36	88	10
EORTC QLQ-C30				
Global QOL	70.21	20.59	100	16.67
Functioning				
Physical function	86.46	13.96	100	33.33
Role function	94.46	14.01	100	0
Cognitive function	77.53	19.79	100	0
Emotional function	81.87	17.63	100	0
Social function	85.77	22.34	100	0
Symptoms				
Fatigue	24.31	20.21	100	0
Pain	14.56	18.17	100	0
Nausea/vomiting	3.44	9.41	100	0
Single questions				
Dyspnea	10.49	17.85	100	0
Insomnia	27.51	28.01	100	0
Poor appetite	8.36	16.25	100	0
Constipation	20.56	29.49	100	0
Diarrhea	11.73	21.36	100	0
Financial difficulty	11.23	21.97	100	0

Correlation between FCR, IR, SR, and QOL

The correlations between ASC, BIPQ, and SRQ with the global QOL and 5 functional domains of EORTC QLQ-C30 were summarized in Table 4. FCR was negatively correlated with global QOL ($r = -.21, P < .01$), and with all 5 functional domains: physical functioning ($r = -.15, P < .05$), role functioning ($r = -.14, P < .05$), cognitive functioning ($r = -.12, P < .05$), emotional functioning ($r = -.34, P < .01$), and social functioning ($r = -.18, P < .01$). IR was negatively correlated with global QOL ($r = -.44, P < .01$), and with the 5 functional domains: physical functioning ($r = -.39, P < .01$), role functioning ($r = -.33, P < .01$), cognitive functioning ($r = -.28, P < .01$), emotional functioning ($r = -.40, P < .01$), and social functioning ($r = -.43, P < .01$). SR was positively correlated with global QOL ($r = .47, P < .01$) and with 4 of the functional domains—physical functioning ($r = .15, P < .05$), cognitive functioning ($r = .30, P < .01$), emotional functioning ($r = .32, P < .01$), and social functioning ($r = .15, P < .05$)—but was not related to role functioning.

Predictors of global QOL

In Table 5, variables that were significantly correlated with global QOL in univariate analysis, including socio-demographic and

Table 4
Correlations between ASC, BIPQ, and SRQ with EORTC QLQ-C30.

EORTC QLQ-C30	ASC total		BIPQ total		SRQ total	
	<i>r</i>	<i>P</i> value	<i>r</i>	<i>P</i> value	<i>r</i>	<i>P</i> value
Global QOL	-.21**	.000	-.43**	.000	.47**	.000
Physical function	-.15*	.013	-.39**	.000	.15*	.014
Role function	-.14*	.020	-.32**	.000	.11	.061
Cognitive function	-.12*	.047	-.28**	.000	.30**	.000
Emotional function	-.34**	.000	-.40**	.000	.32**	.000
Social function	-.18**	.002	-.43**	.000	.15*	.000

r = Pearson's correlation; * $p < .05$; ** $p < .01$; *** $p < .001$.

Table 5
Multiple regression analysis predicting global QOL among participants (*N* = 287).

Predictor variable	R	R ²	β	Standard error	Standardized β	<i>P</i> value
Intercept			52.02	6.72		<.001***
Step 1						
SRQ total	.48	.23	.49	.08	.32	<.001***
Step 2						
BIPQ total	.57	.32	-.37	.08	-.24	<.001***
Step 3						
Health status (average vs. good)	.59	.35	-10.27	2.22	-.24	<.001***
Step 4						
Health status (poor vs. good)	.62	.39	-15.81	3.76	-.22	<.001***

* $p < .05$; ** $p < .01$; *** $p < .001$.

medical status factors, FCR, IR, and SR, were entered into the stepwise regression analysis to identify the main predictors of QOL. All variables in the stepwise regression model were tested for a tolerance value >0 and a variance inflation factor ≤ 10 , which indicated low multicollinearity. The analysis identified statistically significant factors (SRQ totals, BIPQ totals, and health status in the socio-demographic and medical status) with which accounted for 39% of the total variance in global QOL and with SRQ totals contributed 22.7% the largest.

Discussion

Of the gynecologic cancer survivors analyzed in this study, approximately 75% had survived for over 2 years since diagnosis. Previous studies found that the QOL of gynecologic cancer survivors tended to improve significantly by 6–12 months after treatment, gradually stabilize after 2 years, and even approach that of healthy counterparts after 3–5 years or longer [6,19]. Our study showed that among gynecologic cancer survivors, global and functional domain-specific QOL was generally good and symptoms were mild, which were consistent with other studies [8,13,19]. Moreover, we found that gynecologic cancer survivors on average scored lower on emotional and cognitive functional domains, and scored lower on global QOL than on any functional domain. Wenzel et al. [13] found that cervical cancer survivors of 5–10 years shared a similar QOL comparable to that of healthy controls, but certain psychological problems and reproductive concerns persisted and pointed these survivors' continuous need for psychological support. The interaction between physiological and psychological status deeply affect cancer survivors. From psychological to physiological, mind drives the body. Gynecologic cancer survivors needed changes in their inherent habits, such as diet control, exercise, etc. It took time for them to search a lifestyle which is appropriate to the patients themselves. In this period, although these cancer survivors' state of health became well and were not significantly different from healthy controls on global QOL, they suffered more on emotional distress, poor social functioning, and symptoms [19].

Concerning the effects of socio-demographic and medical status, FCR, IR, and SR on QOL in gynecologic cancer survivors, SR, IR, and the self-reported health status were statistically significant predictors of global QOL according to our regression analysis. These factors explained a total of 39% of the variance in global QOL, with the largest proportion of the variance explained by SR, 22.7%, followed by IR, 9.7%. This indicated that the QOL of cancer survivors would be influenced more by psychological than by physiological level. The survival time of cancer survivors on average was longer than ten years but not without the worry of sequelae. FCR

constantly existed in cancer survivors and its occurrence was often unrelated to the severity of cancer but related to future insurance [18]. As FCR could cause various degree of stress response or psychological impact in gynecologic cancer survivors at different stages of their recovery, it should be an area of focus for clinicians involved in cancer care. The burden of emotional stress might turn into depression and further influence on health. SR and IR played as important predictors for cancer survivors' well-being in long term. As found in our research, subjects with positive IR generally performed well in the SR and QOL. These findings indicate that well-being and inner equilibrium were based on the patients' self-perception, which was the key point of cognitive restructuring and psychotherapy.

We also correlated other factors including age, social support, and treatment method with QOL in gynecologic cancer survivors. Even though these correlations were statistically significant in univariate analysis, however, they were not satisfied under multivariate analysis. Still these factors were considered important both in research and clinical care settings. Therefore, they were included in further discussion. Our analysis also showed that the methods of treatment undergone by gynecologic cancer survivors had an effect on their QOL in physical, role, and social functional domains with surgery-only treatment being associated with higher QOL vs. surgery plus chemotherapy or surgery plus radiation therapy. These results were similar to those of other studies [8,20]. Physiological problems of survivors generally come from treatment sequelae, such as pelvic or lower abdomen pain, neurotoxicity, fatigue, stress incontinence, urination change, insomnia, fertility problems, sexual dysfunction, early menopause; psychological impact including female role identity, body disturbance, self-deprecation, intimacy change, workplace issue, self-esteem [35–37].

The age of cancer survivors was correlated with QOL in different studies [9,13]. In our study, the younger the gynecologic cancer survivor, the poorer QOL was. This was mainly because the younger cancer survivors, comparing to older, had more economic or child and parents rearing issue. Some survivors failed to return to their workplace or household due to the exhausting treatment and sequelae. Family supports worked as intimate relationship for gynecologic cancer survivors. The support and empathy came from spouses, children, and parents were the most effective. Social support was also important for women with cancer and includes psychotherapy, self-help support, and professionally led groups [38], all of which might help reduce the patients' psychosocial concerns [11]. We found that the level of social support correlated with the social functioning and emotional functioning domains of QOL. Multivariate support was necessary for these survivors to divert their attention, so as to avoid self-negative thoughts. Information sharing with support group members could help them ease their stress and enhance their ability to cope with symptoms [39]. However, the most important and easily neglected was family support, to which family members needed to pay attention.

A limitation of the present study was that patients were from one medical center in northern Taiwan. Patients in other area might have different experiences in cancer recovery. Although the sample size provided sufficient statistical power, the mean survival time of the participants was 6.22 years, ranging from 3 months to 21 years; the variance in survival time within the sample might affect the predictive power of our model for QOL. Patients' support group involvement varied in the format and extent of participation as member. Lack of an operational definition for patient support groups might limit the usefulness of our results, in this regards, an aspect that can be further explored in future research.

The present research provided valuable information to health-care professionals about the QOL of gynecologic cancer survivors, particularly in regard to the negative effects imposed by FCR and IR

and the importance of SR to the QOL of these survivors. Our findings suggested that care providers not only should attend to problems that occur during the treatment period but should also incorporate the use of social resources to help gynecologic cancer survivors deal with long-term psychological adjustment and to provide multifaceted care measures. For instance, survivor education for gynecologic cancer survivors should be oriented more toward teaching the management of self and interpersonal relationships and the use of resources to aid in stress coping or emotional support, in addition to general symptoms management. Care providers should help gynecologic cancer survivors to develop personal coping strategies and support systems, and encourage them to participate in patient support groups and utilize available social resources. Finally, in light of our findings, we recommended that the integration of comprehensive care for gynecologic cancer survivors be considered when planning for oncology case management, oncology nursing care, or cancer counseling clinics.

Conflicts of interest

The authors have declared no conflict of interest regarding the present study.

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