Development and Validity Testing of an Assessment Tool for Oncofertility Barriers in Multidisciplinary Healthcare Providers on the Breast Cancer Team

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Introduction

Breast cancer is the most common cancer in women worldwide. About 40% of breast cancers occur in women of reproductive age (Vanamail, 2019). More than one third of women with breast cancer are concerned about the impact on subsequent pregnancies (Furui et al., 2018; Letourneau et al., 2012; Linkeviciute et al., 2014), and evidence indicates that women whose fertility is affected by cancer treatment are likely to experience negative emotional reactions and poor quality of life (Howard-Anderson et al., 2012; Logan et al., 2019; Ronn & Holzer, 2015). Early detection of fertility intention is vital to providing effective oncofertility care, which requires close interdisciplinary collaboration between reproductive medicine and breast oncology teams (Woodruff, 2015). This collaboration implies that the hospital maintains an oncofertility team that includes nurses, social workers, and psychologists to contact breast cancer survivors (Quinn et al., 2016). Timely initiation of oncofertility care significantly increases the potential to overcome treatment-induced sterility in the future (Linkeviciute et al., 2014). An increasing percentage of reproductive-aged women with breast cancer have access to oncofertility care. They are supported by information on fertility preservation methods to help them make appropriate decisions concerning options to prevent fertility

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loss (Linkeviciute et al., 2014; Omani-Samani & Vesali, 2019). Despite this, the findings of a prior study indicate that patients and healthcare providers hold differing opinions on fertility information needs (Speller et al., 2019). Information provided on therapy-related fertility problems before cancer treatment requires that healthcare providers have adequate communication training to understand the specific needs of their patients.

Previous studies exploring how women with breast cancer become aware of and decide whether to use reproductive technologies or become pregnant show that the information provided by healthcare providers lags far behind the currently available reproductive technology (Huang et al., 2017, 2019). Bringing oncofertility care from the laboratory to the patient’s bedside is the ultimate dream of the oncofertility care team (Zhao et al., 2019). Although most healthcare professionals agree that fertility should be discussed at the time of breast cancer diagnosis (Niemasik et al., 2012; Quinn et al., 2016), only 43.5% of reproductive-aged patients with cancer discussed the risk of infertility with their clinician before treatment (Patel et al., 2020). In addition to individual patient factors, other barriers to oncofertility care exist. A survey from nine developing countries found that barriers to oncofertility practice include lack of awareness among healthcare providers, cultural and religious constraints, lack of insurance coverage and funding to help support oncofertility programs, and high out-of-pocket costs for patients (Salama et al., 2018). Moreover, evidence from China shows significant gaps in oncofertility knowledge among reproductive healthcare professionals (Wang et al., 2019). Although surveys have been used to assess oncofertility practice barriers in oncology and reproductive medicine professionals, they lack complete and valid development. For example, Salama et al. (2018) surveyed the barriers to oncofertility in one of six categories without providing information on the survey development process and validation. In addition, Wang et al. (2019) used an online survey to assess healthcare professionals’ oncofertility attitudes and knowledge. However, they did not explore the comprehensive range of barriers to oncofertility care faced by reproductive medicine professionals.

The number of breast cancer diagnoses among reproductive-aged women continues to increase in Taiwan. For example, new breast cancer diagnoses rose from 1,984 in 2007 to 4,606 in 2017 (Ministry of Health and Welfare, Executive Yuan, Taiwan, 2020). Preventing loss of fertility among these women is an urgent matter. A full understanding of the barriers to oncofertility care in breast cancer patients is vital to multidisciplinary healthcare providers providing effective survivorship care. The findings related to oncofertility barriers are expected to enable the breast care team to provide efficient strategies to overcome obstacles. Nonetheless, healthcare providers lack a reliable and valid tool to assess the related barriers to oncofertility care. Therefore, the purpose of this research was to develop and validate an oncofertility barriers measure that the entire multidisciplinary healthcare provider team may incorporate into standard breast cancer care.

**Methods**

**Design**

This study used a methodological design to develop and then test (using a survey) the validity and reliability of the Oncofertility Barrier Scale (OBS).

**Participants and Setting**

The participants were hospital staff members from Taipei Veterans General Hospital in Taiwan. The inclusion criteria were (a) having previous contact experience with patients with breast cancer before, during, and after patient cancer therapy; (b) > 20 years old; (c) professionally certified; (d) able to read Chinese and complete the questionnaire; and (e) able to provide consent to participate.

**Instrument and Procedure**

This study was conducted between August 2017 and December 2018. The OBS was developed in Taiwan using a two-phase process (Figure 1).

**Phase I: Scale development**

Relevant items were first established using an extensive review of literature addressing the clinical barriers to fertility care among women and hospital staff (Panagiotopoulou et al., 2018; Taylor & Ott, 2016; Vindrola-Padros et al., 2017). In addition, an exploratory qualitative study was conducted to interview and collect data from 16 hospital breast cancer care providers, including eight nurses (one nurse practitioner, one case manager, and six registered nurses working in the outpatient department or wards), three doctors in the breast center, two gynecologists, one Chinese medicine doctor, one psychological consultant, and one social worker. Because patients must pay out of pocket for fertility preservation, social workers may be expected to provide psychological and financial referrals and advice on available resources. Oncofertility barriers were addressed as negative perceptions encountered during the course of providing interdisciplinary care, which is a process that requires tremendous collaboration between reproductive medicine and oncology teams. Questions included in the interview guidelines included “What is your perception of pregnancy in women with cancer?”; “What is your care experience with regard to women with cancer and their desire for children?”; “When and why do women with breast cancer want to get pregnant?”; “What are the considerations under which you would help women with breast cancer with fertility preservation or becoming pregnant?”; and “What experiences have you encountered?” Data were analyzed until theoretical saturation. An initial pool of 36 potential items was generated using the two methods described above, of which 30 items were derived from the literature review and interview results and 6 items were derived from personal perspectives based on interview findings (e.g., I feel that the physical condition of cancer patients after pregnancy is worse than that of the
average person; I feel that assessing patient fertility needs proactively increases patient anxiety). The response for each item was scored using a 5-point Likert scale (1 = not agree, 2 = somewhat agree, 3 = agree, 4 = quite agree, and 5 = highly agree), with higher scale scores associated with greater self-perceived difficulty among hospital staff in providing oncofertility care.

An expert rating was conducted to delete unnecessary items and refine the useful items. Ten experts were asked to rate the initial 36-item pool (n = 10) and the face validity from nurses (n = 10).

**Scale Validation**

A. Item analyses \(^a\) (n = 184)

B. Validity
   a. Factor analysis \(^b\) (n = 184)

C. Reliability
   a. Internal consistency reliability \(^c\) (n = 184)
   b. Test–retest reliability (n = 17) \(^d\)

**Phase II: Scale validation**

Based on the sample size recommendations of Tinsley and Tinsley (1987), the minimum sample size for this study was calculated as 180. A convenience sample of 210 hospital staff members was enrolled from a medical center in Taipei. All of the participants responded to a demographic questionnaire, which gathered information on participant age, gender, educational level, occupation, years of work experience, marital status, and number of children, and the initial 36-item OBS. Completing the questionnaire required about 15–20 min. To reduce the number of items and refine the scale, discrimination analysis and internal consistency of the reliability analysis were conducted. In addition, an exploratory factor analysis was conducted to evaluate the construct validity and identify the underlying components of the OBS items (Fabrigar et al., 1999).

The reliability of the initial OBS was validated by measuring the internal consistency and test–retest reliabilities. The Cronbach’s alpha coefficient and correlation analyses of the scores among items, factors, and the total scale were used to assess the internal consistency of the OBS. Seventeen nurses from the oncology ward, all of who were among the 184 valid participants, were assigned to the test–retest group and asked to complete the OBS a second time within 3 months of the initial survey. The selection of the group of nurses in the ward was made using convenience sampling.

### Ethical Consideration

This study was approved by the ethics review committee of Taipei Veterans General Hospital (No. 2017-01-011AC).

### Statistical Analysis

The number and percentages for numerical variables and mean ± standard deviation for the measurement variables were used to express the outcomes. The items with average scores in the top 27th and lowest 27th percentiles were assigned to different groups for analysis (Kelley, 1939). The independent t test was used to examine whether the difference between the highest and lowest percentile groups differed statistically (p < .05). To discriminate the adequacy of each item from the subject response, a critical ratio of more than 3.5 was applied. Statistically significant items with item total correlations of less than .30 or greater than .85 were also deleted to reduce the number of items (Kelley, 1939).
The Kaiser–Meyer–Olkin Measure of Sampling Adequacy (KMO) and Bartlett’s Test of Sphericity were both used to determine the adequacy of the data for the factor analysis. Significantly low p values (p < .05) on Bartlett’s Test of Sphericity and KMO values between .8 and 1 were interpreted as indicating the sampling was adequate (Fabrigar et al., 1999). The main analysis method was principal axis factoring with direct oblimin rotation (Pett et al., 2003). The final factor solution was based on the results and a scree plot, eigenvalues greater than 1, the percentage of variance explained, and factor loadings greater than .35 (Fabrigar et al., 1999; Yong & Pearce, 2013). The literature suggests that values for corrected item total correlation coefficients of > .2 indicate good correlation (Streiner et al., 2003). The two-tailed test for Spearman correlation was calculated in the test–retest analysis.

**Results**

**Sample Characteristics**

During the study period, 210 hospital staff members met the inclusion criteria. Twenty-six declined to participate, and 184 valid questionnaires were obtained, giving a response rate of 87.6%. The 184 participants ranged in age from 23 to 62 years (35.33 ± 9.73 years). Over half (57.6%) were single, 87.5% were registered nurses, and 96.2% were women (Table 1).

**Validity**

In this study, three item-level CVI and scale-level CVI scores in the OBS for relevance, importance, and appropriateness were rated higher than .96. Nine items were deleted in the item-level analyses based on the item analysis results (Table 2). The result of the scree plot suggested that only six factors should be extracted (KMO = .85; Bartlett’s Test of Sphericity: χ² = 2881.34, p < .001). The results of both oblimin and varimax rotations showed a six-factor solution and a clear loading pattern (Table 3). The principal axis factoring identified six factors that explained 57.63% of the total variance, with an eigenvalue greater than 1 (Table 4). Finally, no item was removed from the scale, with the remaining 27 items retained for further analysis.

Eight of the final items assessing the respondent’s perceptions about lack of oncofertility-related information comprised the first factor: “lack of information and education” (e.g., I feel I do not understand the information about oncofertility). Seven items assessed the respondent’s perceptions regarding the fixed idea of clinical care, which comprised the second factor: “rigid thinking about oncofertility care” (e.g., I believe that the need to assess fertility protection may be performed only by a physician). The three items that assessed the respondent’s perceptions regarding a weakened condition in cancer patients comprised the third factor: “cancer patient stereotypes” (e.g., I feel that the strength of cancer patients to take care of themselves is worse than that of the average person). The three items that assessed perceptions about the harm of fertility preservation and safety comprised the fourth factor: “fertility risk” (e.g., I feel it is dangerous to have a child after cancer treatment). The four items that assessed perceived potential assistance from people around them comprised the fifth factor: “insufficient support” (e.g., I feel most family members do not support the fertility decisions of cancer patients). Finally, the two items that assessed perceptions about breakpoint decision-making regarding pregnancy planning by breast cancer patients comprised the sixth factor: “interrupted oncofertility care” (e.g., I have no access to information on the birth decision of the patient after treatment).

**Reliability**

Reliability assessments included internal consistency and test–retest reliability. The Cronbach’s alpha coefficient for the 27-item OBS was .91. Deleting each item one by one resulted in Cronbach’s alpha coefficients that were all lower than .91. The range of the item-to-item correlation

| Characteristic | n  | %   |
|----------------|----|-----|
| **Age, years (M and SD)** |    |     |
| 23–30           | 79 | 42.9|
| 31–40           | 52 | 28.3|
| 41–50           | 39 | 21.2|
| ≥ 51            | 14 | 7.6 |
| **Gender**      |    |     |
| Male            | 7  | 3.8 |
| Female          | 177| 96.2|
| **Professional category** |    |     |
| Nurse           | 161| 87.5|
| Physician       | 6  | 3.3 |
| Others          | 17 | 9.2 |
| **Educational level** |    |     |
| College         | 22 | 12.0|
| University      | 145| 78.8|
| Postgraduate    | 17 | 9.2 |
| **Marital status** |    |     |
| Single          | 106| 57.6|
| Married         | 72 | 39.1|
| Widowed/divorced| 6  | 3.3 |
| **Children**    |    |     |
| Yes             | 61 | 33.2|
| No              | 122| 66.3|
| Missing data    | 1  | 0.5 |
| **Employment, years (M and SD)** |    |     |
| < 3             | 52 | 28.3|
| 3–10            | 48 | 26.1|
| 11–19           | 46 | 25.0|
| ≥ 20            | 38 | 20.6|
| No. | Question                                                                                           | Critical Ratio | Correlation to Total Score | Decision* |
|-----|---------------------------------------------------------------------------------------------------|----------------|-----------------------------|-----------|
| 1   | I think it is painful for patients to experience cancer diagnosis.                                  | 2.28*          | .21*                        | Deleted   |
| 2   | I think patients are uncomfortable during cancer treatment.                                        | 1.05           | .16*                        | Deleted   |
| 3   | I think it is difficult for a patient to give birth after cancer treatment.                        | 2.01*          | .23*                        | Deleted   |
| 4   | I think cancer patients should return to the family after treatment.                               | 0.40           | −.02                        | Deleted   |
| 5   | I think that reproductive-aged women with cancer are charged with the task of pregnancy and childbirth. | 2.56*          | .14                         | Deleted   |
| 6   | I think that pregnancy and childbirth play important roles in maintaining patients’ marriages.    | 1.28           | .03                         | Deleted   |
| 7   | I think that fertility preservation (such as oocyte retrieval surgery) can delay the patient’s cancer treatment. | 4.34*          | .33*                        |          |
| 8   | I believe that fertility-preserving measures prior to chemotherapy put patients at risk.            | 3.94*          | .30*                        |          |
| 9   | I think it is dangerous to have a child after cancer treatment.                                    | 4.90*          | .40*                        |          |
| 10  | I think patients with children have a lower desire to preserve fertility.                          | 5.82*          | .40*                        |          |
| 11  | I think that older patients have a lower desire to preserve fertility.                             | 7.01*          | .41*                        |          |
| 12  | I think that fertility preservation should only be considered after a patient’s conditions become stable after treatment. | 6.96*          | .51*                        |          |
| 13  | I think patients should follow the doctor’s professional advice on cancer treatment.               | 3.02*          | .32*                        | Deleted   |
| 14  | I will respect the choice of fertility preservation prior to treatment.                           | −1.49*         | −.14                        | Deleted   |
| 15  | I will respect the choice of the patient to decide on pregnancy after treatment.                  | −1.45*         | −.14                        | Deleted   |
| 16  | I think that the strength of cancer patients to take care of themselves is worse than that of the average person. | 6.68*          | .52*                        |          |
| 17  | I think that the body condition of a cancer patient after pregnancy is worse than that of the average person. | 7.65*          | .57*                        |          |
| 18  | I think that the strength of cancer patients to take care of their children is worse than that of the average person. | 7.07*          | .56*                        |          |
| 19  | I think patients with cancer metastasis should not talk about fertility issues.                   | 5.43*          | .39*                        |          |
| 20  | I don’t think it is appropriate to talk about fertility issues with patients who have treatment-induced menopause. | 8.90*          | .58*                        |          |
| 21  | I think that proactive assessment of patient fertility needs increases patient anxiety.           | 8.89*          | .60*                        |          |
| 22  | I believe that the needs of the assessment of fertility protection can only be performed by a physician. | 8.26*          | .55*                        |          |
| 23  | I am not aware of the channels that assist patients in seeking fertility.                          | 9.81*          | .65*                        |          |
| 24  | I am not clear on the referral process for oncofertility preservation.                            | 9.39*          | .65*                        |          |
| 25  | I think that I am not able to assess the patient’s fertility needs.                               | 10.06*         | .67*                        |          |
| 26  | I believe there is too little on-the-job training for oncofertility.                               | 8.24*          | .57*                        |          |
| 27  | I am not sure who should perform the initial assessment for oncofertility.                         | 12.77*         | .67*                        |          |
| 28  | I think patients do not understand the information about oncofertility.                           | 9.53*          | .64*                        |          |
| 29  | I think I do not understand the information about oncofertility.                                  | 10.70*         | .70*                        |          |
| 30  | I think there is a lack of specific information about oncofertility.                              | 8.83*          | .61*                        |          |
| 31  | I will not pay attention to the decision of patients after referral for oncofertility.            | 6.30*          | .50*                        |          |

(continues)
Table 2
Item Analysis of the Initial Oncofertility Barrier Scale (N = 184), Continued

| No. | Question                                                                 | Critical Ratio | Correlation to Total Score | Decision a |
|-----|--------------------------------------------------------------------------|----------------|-----------------------------|------------|
| 32  | I have no access to the information on the birth decision of the patient after treatment. | 7.66*          | .56*                        |            |
| 33  | I don’t think there is a tracking system for cancer patients who give birth. | 5.23*          | .46*                        |            |
| 34  | I think the cost of fertility preservation is too high.                  | 5.63*          | .44*                        |            |
| 35  | I think most family members do not support fertility decisions for cancer patients. | 6.16*          | .50*                        |            |
| 36  | I don’t think there is enough information for cancer patients to make birth decisions. | 7.33*          | .56*                        |            |

a Items with critical ratio absolute values of less than 3.50 or item total correlations of below .30 or above .85 were eliminated.

* p < .05.

Table 3
Factor-Loaded Values and Descriptions of the Oncofertility Barrier Scale (N = 184)

| Item                                                                 | Loading 1 a | Loading 2 b | Mean | SD    | Corrected Item Total Correlation | Cronbach’s α |
|----------------------------------------------------------------------|-------------|-------------|------|-------|----------------------------------|--------------|
| Factor 1: Lack of information and education                         |             |             |      |       |                                  |              |
| 1. I feel I do not understand the information about oncofertility.   | .88         | .87         | 3.59 | 1.07  | .68                              | .93          |
| 2. I am not sure who should perform the initial assessment for oncofertility. | .87         | .83         | 3.42 | 1.23  | .63                              |              |
| 3. I am not clear on the referral process for oncofertility preservation. | .83         | .86         | 3.20 | 1.26  | .62                              |              |
| 4. I feel that I am not able to assess the patient’s fertility needs. | .82         | .78         | 3.58 | 1.07  | .63                              |              |
| 5. I am not aware of the channels that assist patients in seeking fertility. | .78         | .78         | 3.04 | 1.19  | .62                              |              |
| 6. I believe there is too little on-the-job training for oncofertility. | .77         | .75         | 3.77 | 1.04  | .54                              |              |
| 7. I feel patients do not understand the information about oncofertility. | .76         | .69         | 3.63 | 1.01  | .61                              |              |
| 8. I feel there is a lack of specific information about oncofertility | .69         | .56         | 3.64 | 1.02  | .59                              |              |
| Factor 2: Rigid thinking toward oncofertility care                   |             |             |      |       |                                  |              |
| 9. I feel patients with cancer metastasis should not talk about fertility issues. | .63         | .66         | 2.01 | 1.14  | .33                              | .80          |
| 10. I don’t feel it is appropriate to talk about fertility issues to patients with treatment-induced menopause. | .72         | .64         | 2.16 | 1.16  | .53                              |              |
| 11. I feel that older patients have a lower desire to preserve fertility. | .58         | .57         | 2.91 | 1.21  | .35                              |              |
| 12. I believe that the need to assess fertility protection can only be performed by a physician. | .60         | .49         | 2.08 | 1.08  | .49                              |              |
| 13. I feel that fertility preservation should only be considered after the patient’s conditions become stable after treatment. | .54         | .47         | 2.88 | 1.30  | .43                              |              |
| 14. I feel patients with children have a lower desire to preserve fertility. | .56         | .49         | 3.04 | 1.13  | .34                              |              |
| 15. I feel that proactive assessment of patient fertility needs increases patient anxiety. | .57         | .38         | 2.28 | 1.13  | .54                              |              |

(continues)
coefficient was between .01 and .76. The Cronbach’s alpha coefficients for the six factors ranged from .70 to .93 (Table 3). The factor-total correlations ranged from .44 to .78 \((p < .01)\). Only the factor “lack of information and education” and the fertility risk factor were found to be not significantly correlated \((r = .13)\), with all of the other interfactor correlations ranging from .15 to .51 \((p < .05)\). The test–retest reliability coefficient for the OBS was .55 \((p < .01)\).

**Table 3**

**Factor-Loaded Values and Descriptions of the Oncofertility Barrier Scale \((N = 184)\), Continued**

| Item                                                                 | Loading 1 | Loading 2 | Mean  | SD  | Corrected Item Total Correlation | Cronbach’s \(\alpha\) |
|----------------------------------------------------------------------|-----------|-----------|-------|-----|----------------------------------|------------------------|
| **Factor 3: Cancer patient stereotypes**                             |           |           |       |     |                                  | .91                    |
| 16. I feel that the strength of cancer patients to take care of themselves is worse than that of the average person. | -.86      | -.86      | 3.45  | 1.06| .49                              |                        |
| 17. I feel that the body condition of cancer patients after pregnancy is worse than that of the average person. | -.91      | -.89      | 3.52  | 1.05| .55                              |                        |
| 18. I feel that the strength of cancer patients to take care of their children is worse than that of the average person. | -.83      | -.79      | 3.38  | 1.05| .53                              |                        |
| **Factor 4: Fertility risk**                                         |           |           |       |     |                                  | .70                    |
| 19. I feel that fertility preservation (such as oocyte retrieval surgery) can delay the patient’s cancer treatment. | .77       | .84       | 2.11  | 1.01| .29                              |                        |
| 20. I believe that fertility-preserving measures before chemotherapy put patients at risk. | .68       | .67       | 1.65  | 0.96| .25                              |                        |
| 21. I feel it is dangerous to have a child after cancer treatment.  | .55       | .46       | 2.42  | 1.13| .34                              |                        |
| **Factor 5: Insufficient support**                                   |           |           |       |     |                                  | .71                    |
| 22. I feel most family members do not support the fertility decisions of cancer patients. | .26       | .22       | 2.78  | 1.11| .43                              |                        |
| 23. I feel the cost of fertility preservation is too high.          | .69       | .67       | 3.36  | 1.16| .39                              |                        |
| 24. I don’t feel there is enough information for cancer patients to make birth decisions. | .60       | .47       | 3.73  | 0.97| .54                              |                        |
| 25. I don’t think there is a tracking system for cancer patients who want to give birth. | .56       | .44       | 3.83  | 1.01| .47                              |                        |
| **Factor 6: Interrupted oncofertility care**                         |           |           |       |     |                                  | .72                    |
| 26. I will not pay attention to the decision of patients after referral for oncofertility. | .78       | .79       | 2.46  | 1.23| .43                              |                        |
| 27. I have no access to the information on the birth decision of the patient after treatment. | .67       | .59       | 3.25  | 1.10| .53                              |                        |

Note. Extraction method: principal axis factoring.

\(a\) Structure matrix. \(b\) Pattern matrix.

**Table 4**

**Factor Loading After Direct Oblimin Rotation \((N = 184)\)**

| Component                                      | Extraction Sums of Squared Loadings |
|------------------------------------------------|-------------------------------------|
|                                                | Total | % of Variance | Cumulative % |
| Factor 1: Lack of information and education   | 7.94  | 29.42         | 29.42        |
| Factor 2: Rigid thinking toward oncofertility care | 3.01  | 11.13         | 40.54        |
| Factor 3: Cancer patient stereotypes          | 1.76  | 6.52          | 47.06        |
| Factor 4: Fertility risk                      | 1.32  | 4.89          | 51.95        |
| Factor 5: Insufficient support                | 0.81  | 3.01          | 54.95        |
| Factor 6: Interrupted oncofertility care      | 0.72  | 2.68          | 57.63        |

Note. Extraction method: principal axis factoring; \(R^2 = 57.63\%\); KMO = .863; \(\chi^2 = 2881.34\); \(df = 351\); \(p < .001\).
Discussion
Based on the factor analysis for validity, the 27-item OBS comprised six factors, including (a) lack of information and education, (b) rigid thinking toward oncofertility care, (c) cancer patient stereotypes, (d) fertility risk, (e) insufficient support, and (f) interrupted oncofertility care. Previous studies have reported that the main barriers to oncofertility practice may be divided into medical, economic, social, and legal categories (Goldfarb et al., 2016; Salama et al., 2018; Vadaparampil et al., 2012). The results of this study highlighted a lack of information and education, as indicated by the lack of information among healthcare providers, who reported a lack of in-service education courses addressing oncofertility, low referrals, poor communication among healthcare providers, and the absence of an initial assessment tool consistent with medical barriers to providing oncofertility options.

In addition, this study highlighted the significant impact of interrupted oncofertility care on medical barriers. This finding implies that clinical oncofertility care may not be ideally designed or implemented, inferring that more long-term thinking in care involve considering the priority of treatment and the needs of the patient. A previous study indicated that patient age and disease stage were both inversely correlated with referrals (Korkidakis et al., 2019). Healthcare providers who perform routine care only and lack consideration of individual needs may ignore the importance of reproductive protection. More strategies to reduce rigid beliefs of care are recommended.

There is a preexisting belief that pregnancy and childbirth is exhausting for mothers, which causes breast cancer patients to lose energy and experience deteriorating health (Hsieh et al., 2018). This finding is consistent with the factor of cancer survivor stereotypes in our study, which indicates that cancer patients hold a negative body image. Although patients who undergo embryo or oocyte cryopreservation require ovarian stimulation, which delays the initiation of chemotherapy for at least 2 weeks, the evidence suggests that pregnancy after breast cancer does not increase the risk of cancer recurrence (Carneiro et al., 2018; Vukovic et al., 2019). Regarding the factor of fertility risk, the results of this study imply that healthcare providers are concerned regarding safety and about the potential harm that fertility preservation may inflict. Information related to fertility preservation and pregnancy after cancer treatment should be included in on-the-job education to reduce uncertainty.

Based on the findings of this study, the 27-item OBS has an adequate construct and is a valid and reliable instrument for assessing oncofertility in Taiwan.

Limitations
Some limitations of this study must be considered. The hospital staff members who were less likely to be in direct contact with the patient were not excluded from the study, as information inputs from that group were believed to be meaningful. As pregnancy is a culturally sensitive measure, the applicability of the OBS should be reappraised when used in other countries. In addition, we enrolled hospital staff (primarily nurses) from one medical center in Taipei only and did not survey the perceived oncofertility barriers of cancer care teams in other facilities. This sampling bias may undermine the external validity of this scale and its results. Whether or not the identified oncofertility barriers of the breast cancer care team in Taiwan are consistent with those of other multidisciplinary care teams merits further study. Although a 2-week interval was deemed to be ideal for testing the test–retest reliability (Matza et al., 2008; Wiederman, 2002), a 3-month interval was used to test long-term reliability in other related studies (Handeland et al., 2016; Herrmann et al., 2013). Long-term reliability only was tested in this study. Because most of the participants received oncofertility care education after the first interview, only the 17 nurses who had not received oncofertility care education in a ward were recruited to establish test–retest reliability. Multi-item variables are likely to be considerably more reliable than single-item variables (Fabrigar et al., 1999). Thus, the sixth factor of interrupted oncofertility care with two items in the OBS may reduce reliability. Confirmatory factor analysis was not done in our study because of the small sample size. Further research is needed to assess the OBS.

Implications for Practice
Valid and reliable questionnaires are critical to accurately measure the barriers of oncofertility in clinical practice. Misunderstanding of the barriers regarding oncofertility may cause healthcare providers to miss opportunities to assist breast cancer patients with reproductive technologies. Moreover, the authors wanted to provide a reference for further development of breast cancer interventions to prevent potential infertility among women with breast cancer. A complete understanding of the barriers of oncofertility care will help enlighten multidisciplinary healthcare providers, especially clinical nurses.

Conclusions
This validation study demonstrated the OBS as a valid tool for breast cancer care teams to measure and assess oncofertility barriers in Taiwan. Further awareness among nurses, oncologists, gynecologists, social workers, psychologists, and patients may be spread via oncofertility networks, the media, and continuous education. The OBS should be integrated into clinical practice to effectively assess the various barriers to oncofertility care faced by women with breast cancer. The OBS should be useful and helpful for developing specific and effective strategies for clinical care managers to address the oncofertility dilemma.
Acknowledgments

This study was funded by the Ministry of Science and Technology, Taiwan (MOST 106-2314-B-715-004 -MY2) and the Office of Research and Development, MacKay Medical College, Taiwan (MMC RD1091B07). We thank all of the participants in the study for sharing their knowledge and opinions.

Author Contributions

Study conception and design: SMH
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Data analysis and interpretation: CCL, JCYL
Drafting of the article: PHC, SMH
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