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# Tearing down the barriers of exercise after mastectomy: A qualitative inquiry to facilitate exercise among breast cancer survivors

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# Tearing down the barriers of exercise after mastectomy: A qualitative inquiry to facilitate exercise among breast cancer survivors

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## Abstract

*Objective*. Proper exercise immediately after breast cancer surgery (BCS) may prevent unnecessary physical and psychological decline resulting from surgery; however, patients' attitude, barriers, and facilitators for exercise during this period have not been studied. Hence, the current study explored the barriers and facilitators of exercise among breast cancer patients through multiple interviews from immediately after surgery until 4 weeks after BCS.

*Methods*. We conducted three in-depth interviews of 33 breast cancer patients within one month after BCS.

*Results*. We identified 44 themes, 10 codes, and 5 categories from interview results. Physical constraints and psychological resistance were identified as the barriers of exercise, while the sense of purpose and first-hand exercise experience were identified as the facilitators of exercise. By conducting the interviews over the course of 4 weeks after surgery, we monitored patterns of changes in barriers and facilitators over time. Overall, our analyses identified that the professional intervention, which considers both the time since surgery and the physical state after BCS, is essential. The intervention will counteract the overwhelming psychological resistance in the early weeks with the sense of purpose developed in the later weeks.

*Conclusions*. We made suggestions for future research and exercise intervention programs that can benefit breast cancer survivors based on the categories, codes, and themes identified in the current study.


**Keywords:** barriers to exercise; breast cancer; cancer survivors; exercise intervention; exercise promotion; facilitators of exercise; professional support

## Strengths and Limitations

- This is the first study to investigate the barriers and facilitators of exercise immediately after the breast cancer surgery

- Multiple interviews are conducted per participants to examine the effect of time.
- Participants were recruited via one cancer center, if one of the largest one in the country.

## BACKGROUND

The incidence of breast cancer is increasing continuously. Currently, breast cancer is the most common cancer among women, accounting for 24.2% of the cases worldwide and 20.3% of the cases in South Korea.[1] Although the 5-year survival rate of breast cancer is over 93%, substantial number of breast cancer patients experience breast cancer recurrence and suffer from side effects of cancer treatments. Although the rate of breast- conserving surgery has increased from 37.6% in 2002 to 67.4% in 2017, many breast cancer patients develop both short-term and long-term physical impairments such as lymphedema and decreased shoulder strength and range of motion (ROM).[2-5] In addition to physical impairment, the prevalence of depression, distress, anger, and social isolation is high among breast cancer survivors.[6]

Exercise and physical activity (PA) improve the prognosis of breast cancer (e.g., decrease breast cancer-specific and all-cause mortality).[7] The benefit of exercise among breast cancer patients is not limited to improvement in survival. Early implementation of exercises may reduce surgery-related complications,[8] pain,[9] and risk of lymphedema[10] Implementation of exercises such as shoulder ROM and isometric and passive stretching shortly after surgery could improve shoulder ROM during early recovery after surgery.[11]

Although ample evidence exists on the benefits of exercise for recovery after breast cancer surgery (BCS),[12] breast cancer patients are reluctant to participate in exercise during early recovery. Furthermore, few studies have investigated the attitude toward exercise and exercise experience, barriers, and facilitators over the course of time, especially immediately after BCS until 4 weeks after surgery. A few qualitative studies have investigated these factors in cancer survivors after a few months of surgery.[13-15] Particularly, considering the potentially different needs of the breast cancer survivors based on the time passed after surgery, more information on the barriers and facilitators of exercise immediately after BCS can be useful in tailoring exercise intervention programs to the actual needs of breast cancer survivors.

In those regards, the current study investigated the factors related to exercise promotion within one month after BCS. More specifically, by employing the in-depth interview method, the study investigated: (1) the barriers and the facilitators of exercise for breast cancer survivors; (2) the changes in these factors according to time after BCS. Additionally, the current study aimed to complement the intentions expressed in the interviews with the actual behaviors based on the quantitative data on PA.

## METHODS

### Participants

We recruited 33 women who underwent BCS at the breast cancer center of a university medical center in Seoul, Korea, between February 14, 2019 and November 12, 2019, using the criterion sampling technique.[16] Patients who were over 70 years old, had undergone bilateral or reconstruction surgery, or had a history of previous cancer were excluded. The recruitment of new participants was stopped when new data from additional participants did not add new ideas or concepts related to the purpose of the study.[17]

### Ethics Approval Statement

This study was approved by the Institutional Review Board of the hospital (IRB No. 4-2018-1094). All participants provided written informed consent and agreed to be interviewed multiple times within one month after BCS.

### Patient and Public Involvement

The research team has conducted numerous studies on the exercise intervention for the people with cancer. Those who had gone through BCS, in particular, inspired the team to contemplate on the conflicts between the needs for exercise and the fear about the aftereffects of exercise. Based on the observations from previous contacts, the team initiated the current study to get the insights on the way to help them exercise more as a means to overcoming the aftereffects of BCS.

Because of the scanty literature on the patients immediately after BCS, the team decided to employ qualitative approach to listen to the patients' experience. Electronic medical records were screened and potential participants who met all the inclusion criteria were contacted by the physician to explain the research participation opportunity. Patients who agreed to participate in multiple interviews after BCS signed the informed consent. The same procedure was repeated until the saturation point.[16] Three of 36 participants withdrew (one patient dropped out because of re-surgery and the other two refused to participate); thus, 33 patients participated in the current study.

The research participants met with the first author of the current study one day before BCS. This initial meeting was to build a good collaborative relationship between the researcher and the participant. After BCS, the interview was conducted three times during clinic visits: first interview, within two weeks after surgery; second interview, in two to three weeks after surgery; and third interview, within one month after surgery. To ensure the privacy of the participants, face-to-face interviews were conducted. All interviews were conducted in Korean. After the third interview, a professional exercise consultation was provided as a compensation for research participation.

Each in-depth interview session lasted for 10–40 minutes. With the participants' permission, the interviews were audio-recorded and transcribed verbatim. Two different semi-structured interview questionnaires were used (Table 1).

Table 1. Interview questionnaires

| Interview | Questions |
|---|---|
| 1st | • How is the surgery site?<br>• Are there any functional changes in your arm?<br>• Are there any changes in your daily-living activities such as doing chores, putting clothes on, and washing dishes?<br>• Did you exercise during the past week (after surgery)?<br>  • If yes, how often? Why did you exercise?<br>  • If no, why did you not exercise? |

| | |
|---|---|
| 2nd and 3rd | • Compared to the last week, is there any change at the surgery site?<br>• Compared to the last week, are there any changes in your activities of daily living?<br>• Did you exercise during the past week (after surgery)?<br>  • If yes, how often? Why did you exercise?<br>  • If no, why did you not exercise? |
| 3rd | • Could you specify the biggest barriers and facilitators of exercise for the past month?<br>• Would you like say anything to other breast cancer survivors? |

In addition, detailed field notes were taken. Before and after each interview, the interviewer examined the area in which the interviewee reported pain, observed physical changes in the interviewee, and included them in the notes. Moreover, the interviewer noted the insights from the interview process and interactions.

The complementary measurement of the participants' PA level was performed during each interview using the Global PA Questionnaire (GPAQ), developed by the World Health Organization (WHO).[18] The GPAQ comprises 16 items in four domains of PA: work, leisure time, transportation, and sedentary behavior. Participants reported the amount of moderate or vigorous activities related respectively to work or leisure time. The reliability and validity of the Korean version of the GPAQ were examined in a previous study.[19] We added a measure of walking and its frequency and duration, which is not included in the original GPAQ but is relevant to the current study.

**Characteristics of Researchers**

The research team of the current study is composed of two breast surgeons, a psychologist, and four exercise specialists. All interviews were conducted by an exercise specialist (SJY). The leader of exercise specialists (JYJ) has been working with cancer patients for over 10 years, developing and testing exercise programs tailored for various cancer patients under different conditions. The interpretation and categorization of the interview results were discussed among team members, (two breast surgeons [JYK and SIK], a psychologist [ASJ],

and exercise specialists [SJY, JHM, JYB, and JYJ]).

**Trustworthiness**

To increase the trustworthiness of data,[20] we have employed three different methods: reflective note, observation, and member check. After each interview, the exercise specialist reflected on their performance as an interviewer. Mistakes and important lessons learnt were recorded in a reflective note and methods to improve the quality and depth of interviews were practiced before the next interview. A sufficient amount of time was spent observing participants' physical performance and symptoms including shoulder ROM, strength, pain, and other medical treatment. To increase the reliability of the findings, interviews were conducted three times over four weeks as participants underwent treatment. The transcript and summary of each interview were confirmed by the participants to ensure the transcriptions and summaries correctly reflected what they intended to express.

**Analysis**

Guided by the Grounded Theory,[21] the team started with open coding, identifying the themes that emerged from the verbatim transcripts. In addition, the field notes were included in the analysis to avoid loss of non-verbal information. Immediately after the team agreed on the first group of themes collectively, the authors worked on the subsequent transcripts individually. The team conducted regular meetings and worked on abstracting the codes and then the categories to proceed to the selective coding collectively. During the constant comparative analysis, member checking was performed to increase the validity of the analysis. The analysis results were sent to three randomly selected interviewees to confirm the meaning and nuance of answers, and thereby, their experience as breast cancer survivors.

Complementary quantitative data analysis was performed using a repeated measures analysis of variance to compare the means of PA total and walk, before surgery and during the first, second, and third interview.

## RESULTS

### Participant Description

The characteristics of the 33 participants are presented in Table 2. Characteristics such as age, weight, surgery type, cancer stage, dominant arm, operation side, post-operative day (POD, from 1 through 30 days), and whether they had neo-adjuvant chemotherapy were analyzed.

Table 2. Characteristics of the participants REDACTED DUE TO POTENTIAL IDENTIFYING INFORMATION – PLEASE SEE PUBLISHED VERSION

### *Intervention Needed in Time for Physical Recovery*

The interviewees identified multiple factors that either facilitated participants to exercise more or hinder them from exercising after BCS. Out of the 44 themes that emerged from the interviews, 10 codes and 5 categories were identified (Table 3). Physical constraints and psychological resistance were identified as the barriers for exercise, whereas the sense of purpose and first-hand exercise experience were identified as the facilitators for exercise during the early stage of rehabilitation after BCS. The overwhelming physical constraints that produced psychological resistance in the earlier weeks after surgery appeared to be gradually substituted by the sense of purpose that derived from the first-hand experience encouraged by diverse sources. This conclusion is consistent with the PA data: the motivation to perform exercise and PA materialized with time (Table 4). Quantitative data of 31 participants were collected and analyzed. Analysis revealed that the total PA level statistically significantly changed over time ($F = 3.64$, $p < .05$). The supportive intervention that reflects an individual patient's physical condition can expedite the substitution process, if provided properly. Our analyses revealed the core variable that answered our research questions was "*intervention needed* in time for physical recovery" to meet the varying needs of the survivors according to

the time after BCS (Figure 1).

Table 3. Themes, codes, and categories from the interviews

| Categories | Codes | Themes |
|---|---|---|
| Physical constraints | Postoperative syndrome | Lymphedema, seroma |
| | | Pain |
| | | Limited mobility of the arm |
| | | Feeling weak |
| | Operation-derived condition | Drain |
| | Non-operation-derived condition | Neoadjuvant therapy |
| | | Pre-existing physical condition |
| Psychological resistance | Perception and attitude | Believing that daily living activities are sufficient |
| | | Unaware of the requirement of exercise |
| | | Exercise not prioritized |
| | | Not wanting to burden the body |
| | | Lack of self-efficacy regarding exercise |
| | | Psychological withdrawal |
| | Concerns from the lack of accurate information | Concerns regarding the potential side-effects of exercise |
| | | Concerns regarding injuries |
| | | Concerns regarding the timing being inappropriate |
| | | Concerns regarding the etiology and symptoms of the cancer – related to exercise |
| | | Own theory regarding the etiology and the symptoms of the cancer – related to exercise |
| Sense of purpose | Encouragement and support | From family |
| | | From medical professionals |
| | | From exercise therapists |
| | | From other cancer patients |
| | | From media |
| | Expected benefits | Speed up the recovery |
| | | Recover from the postoperative syndrome |
| | | Health management |
| | | Muscular strength |
| | | Increase muscle mass |
| | | Improve flexibility |
| | | Prevent relapse by promoting health |
| | | General physical health |
| | | Break unhealthy lifestyle |

| | | |
|---|---|---|
| | | Prevent weight gain |
| | | Maintain healthy lifestyle |
| First-hand experience | Benefits of exercise | Reduced pain |
| | | Promoted flexibility |
| | | Increased amount of exercise |
| | | Increased physical activities |
| | | Reduced discomforts |
| | | Expedited recovery |
| | Heightened sense of purpose | Attribution of cancer to the lack of exercise |
| | | Want to exercise more |
| Intervention needed | Accurate information and education | Want consultation regarding symptoms |
| | | Want information/education in accordance with the proper timing |

Table 4. Comparison of physical activity ($N = 31$)

| | Before surgery *M* (*SD*) | 1st interview *M* (SD) | 2nd interview *M* (*SD*) | 3rd interview *M* (*SD*) | *F* |
|---|---|---|---|---|---|
| VPA (min/week) | 0 | 0 | 0 | 0 | N/A |
| MPA (min/week) | 41.0 (113.4) | 0 | 0 | 12.3 (54.1) | N/A |
| Total PA (min/week) | 142.6 (167.6) | 49.8 (61.6) | 96.1 (175.4) | 142.6 (161.9) | 3.64* |
| Walk (min/week) | 204.4 (208.0) | 142.1 (165.3) | 173.1 (139.1) | 222.9 (166.4) | 2.31 |

MPA, moderate physical activity; *M* (*SD*), mean (standard deviation); VPA, vigorous physical activity.

*$p < .05$

**Barriers to Exercise**

*Physical Constraints*. Breast cancer patients who underwent surgery experienced multiple types of physical restraints, which made it hard for them to participate in or even to think about exercise. Most frequently reported barrier to exercise was pain, followed by limited shoulder ROM and frequent by-products of the treatment including seroma and the drain attached to the body. All these contributed to a sense of weakness throughout the body, especially among those who received neo-adjuvant chemotherapy.

*"I couldn't exercise after the surgery. I am not eating well and do not feel*

*strong. It's not just my arm that feels weak; my whole body feels weak. I lay inert or just sat leaning on something, most of the time."* (Participant #19, PM/ALND, first interview)

*"(After the drain was removed) This (seroma) started leaking and I felt so distressed. It stressed me out. Only a few drops, you know, when it leaks, are enough to feel so awkward. Thinking about it, I couldn't exercise. This past week was more uncomfortable."* (Participant #19, PM/ALND, third interview)

*Psychological Resistance.* The physical constraints paved a way for the participants to feel entitled to not exercise because they believed that "physical activities may be harmful or at least drain their energy." Moreover, although the physical condition permitted, participants did not feel motivated enough to exercise. Sometimes, their anxiety regarding possible injuries in exercising undermined their wish to become more physically active. Other times, they excused themselves from doing more exercise as "daily living and house chores are good enough exercise." In addition to these concerns and excuses, their pre-existing perception and attitude that did not prioritize exercise appeared to discourage them from exercising after surgery.

*"Well, I didn't do much. I couldn't exercise at all because of the pain. The armpit feels tight and poking. What if moving causes more pain? Worried about it, I can't exercise.."* (Participant #27, TM/SLNB, third interview)

*"I couldn't exercise… Well, I thought of looking over the booklet (of exercise education), but didn't. I don't recall why I didn't, but time passed while I was taking care of my grandkids. I put it on the dining table and didn't reach for it later. I did try stretching my arm lying down on the bed. It wasn't painful though."* (Participant #13, PM/SLNB, first interview)

Notwithstanding, the lack of accurate information was identified as a significant

reason for the patients to not take courage to exercise. After surgery, considering all the byproducts of operation, whether anticipated or unanticipated, patients' anxiety was not ungrounded. Accurate information regarding the types of activities and exercises that speed up the recovery from diverse postoperative symptoms was important.

> *"Well, I can't find the information I need.. when should I work on muscles, when can I jog or run.. I don't know.."* (Participant #33, PM/SLNB, first interview)

Often, different health professionals such as surgeons, medical oncologists, physiatrists, and plastic surgeon (in case patients underwent breast reconstruction) provided different information on when and how to exercise. Lack of information or inconsistent information was the barrier to exercise for breast cancer patients.

**Facilitators of Exercise**

*Accurate Information*. Accurate information on exercise according to the time after surgery was identified as the key facilitator to promote exercise among patients. The patients expressed their wish to have some professional consultation regarding exercise interventions that take their symptoms and health conditions into account.

*Encouragement and Support*. In the process of recovery after BCS, patients reported social support as an important factor that motivated them to exercise more. Diverse sources worked, including medical professionals, exercise therapists, friends, family members, as well as fellow cancer patients.

> *"(Other patients in this rehab center says) You have to exercise. Otherwise, it'll become stiff. Those who have experienced something like myself informed me to do this and that, even regarding how to wash up. It's a great help from these folks who have been or are going through the similar experiences (treatment processes).. It's good."* (Participant #28, PM/ALND, third interview)

*First-hand Experience*. The participants reported their first-hand experience as an important motivator for exercise. They increased the activity level and exercised more after knowing the positive effects of exercise through experience.

> *"The more I exercise, the larger this angle becomes. It was really hard to follow the instructions when I wasn't working out. The more I tried, however, the easier it became. So I realized the importance (of exercise). If I do not exercise, it will be harder. So whenever it pops up in my mind, I try to do some exercise. Even in waking up, I tried to do some arm stretching."* (Participant #24, TS/SLNB, second interview)

*Sense of Purpose*. All the aforementioned factors contributed to the patients' sense of purpose, expecting the benefits of exercise. The expectation included pain reduction, fast recovery, relapse prevention, and health management. The patients who had mastectomy tried to motivate themselves to exercise more. In addition, they frequently expressed their wish to increase physical strength, muscle mass, and flexibility, as well as to maintain a healthy lifestyle.

> *"(People say) It takes 3 months to recover from the surgery, but recovery is up to me, I figure. Exercising and building muscles are up to me. So I do exercise."* (Participants #2, TM/SLNB, third interview)

> *"I think I got cancer because I had not exercised… There's no other reason. You know, there's no known cause for the triple negative breast cancer.. I guess it's from my not exercising… So I do exercise now, do walking at least."* (Participant #9, PM /SLNB, second interview)

**How Time Works**

During the current study, the participants showed a certain pattern related to the time after BCS. Diverse factors contributed to the heightened psychological resistance, resulting in

no or minimal exercising, in the early weeks after BCS. However, with time and the support of professional and social contacts, the patients expressed an increased sense of purpose. Support from external sources, as well as own first-hand experience, produced this sense of purpose. The motivation along with proper instruction of tailored exercise intervention is projected to offset the psychological resistance in the early weeks after BCS (Figure 1). This pattern is consistent with the participants' actual amount of PA participation, which increased gradually from immediately after surgery to four weeks after surgery (Table 4).

## DISCUSSION

### Summary of Results

We employed an in-depth interview technique repeatedly within one month after BCS and identified the barriers and facilitators of exercise among breast cancer survivors. Physical constraints that were prominent in the early weeks, as reported in the literature,[22-23] along with the pre-existing perception and attitude toward exercise developed psychological resistance to exercise among the patients. However, an increase in motivation to exercise was observed among patients in later weeks thanks to more encouragement from others, as was reported in other studies,[24-26] and higher sense of purpose from their own experience.

This process of increasing the sense of purpose, replacing the psychological resistance, seemed to be propelled by a professional intervention that reflected the timing of right exercise. There was no disagreeing among the participants that more accurate information and education were required to promote exercise. Multiple physical, psychological, and environmental circumstances served as conditions for psychological resistance among patients. The resistance grounded on the anxiety and fear of unintended injuries and unanticipated side-effects as a cancer survivor can only be managed with professional diagnosis and prescription of exercise. The complementary PA data revealed that patients' sense of purpose was positively associated with their actual amount of PA participation, reinforcing the requirement for professional

intervention at the right time.

**Study Limitations and Strengths**

This qualitative study included only 33 participants. Hence, generalization of the results to all breast cancer survivors should be made with caution. Particularly, considering that the recruiting site was one of the major general hospitals in Korea, the lived experiences of people living in rural areas or those treated in smaller hospitals, for instance, could not be captured in the current study. Therefore, to advance our understanding regarding the professional intervention that was identified as the key factor to promote exercise among the participants, a randomized control study should be performed. The long-term and short-term physical as well as psychological benefits of exercise can be examined more comprehensibly by investigating the effects of exercise intervention, preferably in a longitudinal study.

The strengths of the current study included repeated interviews over four weeks after surgery which enable us to observe the change in patients' attitude toward exercise over time. Especially, in the current study, breast cancer patients were interviewed from only one week after surgery before implementation of exercise or rehabilitation intervention; however, recent studies have reported the importance of early exercise intervention after surgery in cancer patients.

**Clinical Implications**

To mitigate the constant feedback loop between physical and psychological excuses, a clever exercise intervention should be designed. Considering the diverse anxiety expressed in the current study, tailored programs should consider each patient's physical and psychological needs to optimize the potential effects of the program.

Many breast cancer patients do not participate in PA and experience significant muscle mass loss during the first few months after surgery, which is associated with increased risk of type 2 diabetes and worse prognosis, including increased risk of recurrence.[27-28] The findings

of the current study revealed that breast cancer patients can benefit from early participation of exercise and PA, which may prevent loss of shoulder ROM and strength after BCS. In addition, the current study provides information regarding the attitude of breast cancer patients toward exercise during the early recovery stage after surgery and thus, promotes the development of appropriate intervention strategies.

**Conclusions**

Thirty-three breast cancer survivors shared their experience and thoughts regarding exercise after BCS. Commonly expressed needs of the participants were summed as a professional intervention that takes into account the time after surgery and each individual's physical condition. Exercise was not only a matter of motivation and will power, but also a matter of resources that can be used with physical and psychological comfort.

## Contributorship statement

SJY and JYJ participated in study design. SJY, JHM, JYK, SIK and JYJ participated in data collection. SJY, ASJ, JHM, JYB, JYK, SHP, SIK and JYJ participated in data analysis and interpretation. ASJ, SJY, CWL, YJY, JMH and JYJ participated in the manuscript writing. All authors participated in the manuscript review and revision.

## Competing interests

None declared.

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## Data sharing statement

Data are available upon reasonable request. Interview transcripts will be available upon request on the specific area of interest.

Figure 1. Relations among categories according to time, which changes the weight of the barriers and facilitators of exercise

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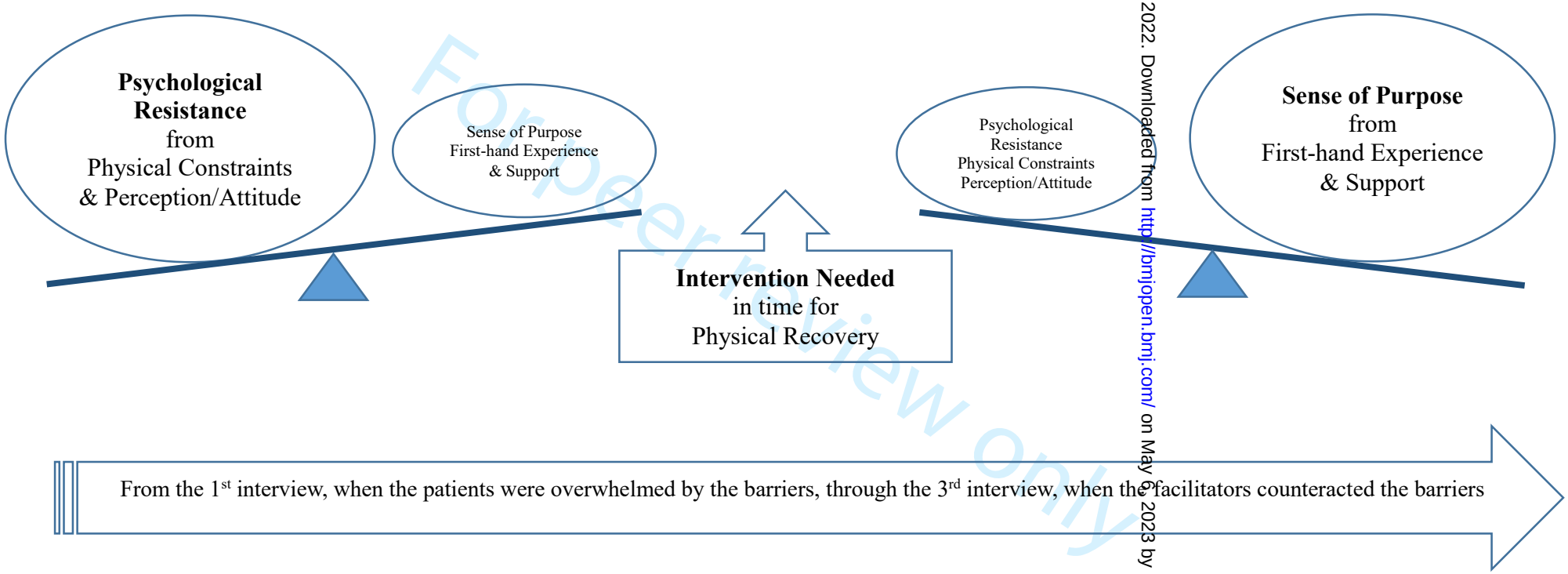
Figure 1. Relations among categories according to time, which changes the weight of the barriers and facilitators of exercise



# COREQ (COnsolidated criteria for REporting Qualitative research) Checklist

A checklist of items that should be included in reports of qualitative research. You must report the page number in your manuscript where you consider each of the items listed in this checklist. If you have not included this information, either revise your manuscript accordingly before submitting or note N/A

| Topic | Item No. | Guide Questions/Description | Reported on Page No. |
|---|---|---|---|
| **Domain 1: Research team and reflexivity** | | | |
| *Personal characteristics* | | | |
| Interviewer/facilitator | 1 | Which author/s conducted the interview or focus group? | 7 |
| Credentials | 2 | What were the researcher's credentials? e.g. PhD, MD | 1 |
| Occupation | 3 | What was their occupation at the time of the study? | 7 |
| Gender | 4 | Was the researcher male or female? | - |
| Experience and training | 5 | What experience or training did the researcher have? | 7 |
| *Relationship with participants* | | | |
| Relationship established | 6 | Was a relationship established prior to study commencement? | 5 |
| Participant knowledge of the interviewer | 7 | What did the participants know about the researcher? e.g. personal goals, reasons for doing the research | -- |
| Interviewer characteristics | 8 | What characteristics were reported about the inter viewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic | 7 |
| **Domain 2: Study design** | | | |
| *Theoretical framework* | | | |
| Methodological orientation and Theory | 9 | What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis | 8 |
| *Participant selection* | | | |
| Sampling | 10 | How were participants selected? e.g. purposive, convenience, consecutive, snowball | 5 |
| Method of approach | 11 | How were participants approached? e.g. face-to-face, telephone, mail, email | 5 |
| Sample size | 12 | How many participants were in the study? | 5 |
| Non-participation | 13 | How many people refused to participate or dropped out? Reasons? | 5 |
| *Setting* | | | |
| Setting of data collection | 14 | Where was the data collected? e.g. home, clinic, workplace | 6 |
| Presence of non-participants | 15 | Was anyone else present besides the participants and researchers? | 6 |
| Description of sample | 16 | What are the important characteristics of the sample? e.g. demographic data, date | Table2 |

| Topic | Item No. | Guide Questions/Description | Reported on Page No. |
|---|---|---|---|
| *Data collection* | | | |
| Interview guide | 17 | Were questions, prompts, guides provided by the authors? Was it pilot tested? | Table1 |
| Repeat interviews | 18 | Were repeat interviews carried out? If yes, how many? | 6 |
| Audio/visual recording | 19 | Did the research use audio or visual recording to collect the data? | 6 |
| Field notes | 20 | Were field notes made during and/or after the interview or focus group? | 6 |
| Duration | 21 | What was the duration of the interviews or focus group? | 6 |
| Data saturation | 22 | Was data saturation discussed? | 5 |
| Transcripts returned | 23 | Were transcripts returned to participants for comment and/or correction? | 7-8 |
| **Domain 3: analysis and findings** | | | |
| *Data analysis* | | | |
| Number of data coders | 24 | How many data coders coded the data? | 8 |
| Description of the coding tree | 25 | Did authors provide a description of the coding tree? | Table 3 |
| Derivation of themes | 26 | Were themes identified in advance or derived from the data? | 8 |
| Software | 27 | What software, if applicable, was used to manage the data? | N/A |
| Participant checking | 28 | Did participants provide feedback on the findings? | 7-8 |
| *Reporting* | | | |
| Quotations presented | 29 | Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number | 12-15 |
| Data and findings consistent | 30 | Was there consistency between the data presented and the findings? | 8-15 |
| Clarity of major themes | 31 | Were major themes clearly presented in the findings? | 8-15 Table 3 |
| Clarity of minor themes | 32 | Is there a description of diverse cases or discussion of minor themes? | 15-16 Table 3 |

Developed from: Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32 item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. 2007. Volume 19, Number 6: pp. 349–35

BMJ Open

# Tearing down the barriers of exercise after mastectomy: A qualitative inquiry to facilitate exercise among breast cancer survivors

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# Tearing down the barriers of exercise after mastectomy: A qualitative inquiry to facilitate exercise among breast cancer survivors

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## Abstract

*Objective*. Proper exercise immediately after breast cancer surgery (BCS) may prevent unnecessary physical and psychological decline resulting from surgery; however, patients' attitude, barriers, and facilitators for exercise during this period have not been studied. Hence, the current study explored the barriers and facilitators of exercise among breast cancer patients through multiple interviews immediately after surgery through 4 weeks after BCS.

*Methods*. We conducted three in-depth interviews of 33 breast cancer patients within one month after BCS.

*Results*. We identified 44 themes, 10 codes, and 5 categories from interview results. Physical constraints and psychological resistance were identified as the barriers of exercise, while a sense of purpose and first-hand exercise experience were identified as the facilitators of exercise. By conducting the interviews over the course of 4 weeks after surgery, we monitored patterns of changes in barriers and facilitators over time. Overall, our analyses identified that professional intervention based on the time since surgery and the physical state after BCS is essential. The intervention would counteract the overwhelming psychological resistance in the early weeks by developing a sense of purpose in the later weeks.

*Conclusions*. We made suggestions for future research and exercise intervention programs that can benefit breast cancer survivors based on the categories, codes, and themes identified in the current study.


**Keywords:** barriers to exercise; breast cancer; cancer survivors; exercise intervention; exercise promotion; facilitators of exercise; professional support

## Strengths and Limitations

- The participants were recruited immediately after the breast cancer surgery and shared their experiences regarding multiple factors.

- To examine the effect of time, multiple interviews were conducted from immediately after surgery up to one month after surgery.
- This study was conducted at the tertiary hospital in South Korea and generalization of the findings from the current study to other regions and countries should be made careful.

## BACKGROUND

The incidence of breast cancer has been continually increasing. Currently, breast cancer is the most common cancer among women, accounting for 24.2% of the cases worldwide and 20.3% of the cases in South Korea.[1] Although the 5-year survival rate of breast cancer is over 90 % for Stage 0-2 breast cancer patients in South Korea, a substantial number of breast cancer patients experience breast cancer recurrence and suffer heavily from side effects of cancer treatments.[2] Although the rate of breast-conserving surgery has increased from 37.6% in 2002 to 67.4% in 2017, many breast cancer patients develop both short-term and long-term physical impairments such as lymphedema, decreased shoulder strength, and range of motion (ROM).[3-6] In addition to physical impairment, the prevalence of depression, distress, anger, and social isolation is high among breast cancer survivors.[7]

Exercise and physical activity (PA) improve the prognosis of breast cancer (e.g., decrease breast cancer-specific and all-cause mortality).[8] The benefit of exercise among breast cancer patients is not limited to improvement in survival. Early implementation of exercises has been shown to reduce surgery-related complications,[9] pain,[10] and risk of lymphedema[11]. Exercises such as shoulder ROM exercise and isometric and passive stretching shortly after surgery could improve shoulder ROM during early recovery after surgery.[12]

Although ample evidence exists on the benefits of exercise on recovery after breast cancer surgery (BCS),[13] breast cancer patients are reluctant to participate in exercise during early recovery. Furthermore, few studies have investigated the attitude toward exercise and exercise experience, barriers, and facilitators over an extended period of time, particularly immediately after BCS until 4 weeks after surgery. A few qualitative studies have investigated these factors in cancer survivors after a few months of surgery[14-16]. Considering the various different needs of the breast cancer survivors depending on the time post-surgery, more information on the barriers and facilitators of exercise immediately after BCS can potentially

be useful in tailoring exercise intervention programs to the specific needs of breast cancer survivors.

In these regards, the current study investigated the factors related to exercise promotion within one month after BCS. More specifically, by employing the in-depth interview method, the study investigated: (1) the barriers and the facilitators of exercise for breast cancer survivors; (2) the changes in these factors according to time after BCS. Additionally, the current study aimed to complement the intentions expressed in the interviews with the actual behaviors based on the quantitative data on PA.

## METHODS

### Participants

We recruited 33 women who underwent BCS at the breast cancer center of a university medical center in Seoul, Korea, between February 14, 2019 and November 12, 2019, using the criterion sampling technique.[17] Patients who were over 70 years old, had undergone bilateral or reconstruction surgery, or had a history of previous cancer were excluded. The recruitment of new participants was stopped when new data from additional participants did not add new ideas or concepts related to the purpose of the study.[18]

### Ethics Approval Statement

This study was approved by the Institutional Review Board of the hospital (IRB No. 4-2018-1094). All participants provided written informed consent and agreed to be interviewed multiple times within one month after BCS.

### Patient and Public Involvement

From previous experiences with people who underwent BCS, the research team developed the research question and aimed to make relevant contributions to their real lives. Because of the lack of literature studying patients immediately after BCS, however, the team decided to employ qualitative approach to understand the patients' experience.

Potential participants who met all the inclusion criteria were contacted by the physician to explain the research participation opportunity. Patients who agreed to participate in multiple interviews after BCS signed the informed consent. The same procedure was repeated until the saturation point.[17] Three of 36 participants withdrew (one patient dropped out because of re-surgery and the other two refused to participate); thus, 33 patients participated in the current study.

The research participants met with the first author of the current study one day before BCS, to build a collaborative relationship between the researcher and the participant. After BCS, the interview was conducted three times during clinic visits: first interview within two weeks after surgery; second interview between two and three weeks after surgery; and third interview between three weeks and one month after surgery. All interviews were conducted one-on-one in Korean. With the participants' permission, the interviews were audio-recorded and transcribed verbatim, with two different semi-structured interview questionnaires (Table 1). Only after all the three interviews were completed, a professional exercise consultation was provided as a compensation for research participation, not as a component of this study.

Table 1. Interview questionnaires

| Interview | Questions |
|---|---|
| 1st | • How is the surgery site?<br>• Are there any functional changes in your arm?<br>• Are there any changes in your daily-living activities such as doing chores, putting clothes on, and washing dishes?<br>• Did you exercise during the past week (after surgery)?<br>  • If yes, how often? Why did you exercise?<br>  • If no, why did you not exercise? |
| 2nd and 3rd | • Compared to the last week, is there any change at the surgery site?<br>• Compared to the last week, are there any changes in your activities of daily living?<br>• Did you exercise during the past week (after surgery)?<br>  • If yes, how often? Why did you exercise?<br>  • If no, why did you not exercise? |

| | |
|---|---|
| 3rd | • Could you specify the biggest barriers and facilitators of exercise for the past month?<br>• Would you like say anything to other breast cancer survivors? |

The complementary measurement of the participants' PA level was performed during each interview using the Global PA Questionnaire (GPAQ), developed by the World Health Organization (WHO).[19] The GPAQ comprises 16 items in four domains of PA: work, leisure time, transportation, and sedentary behavior. The reliability and validity of the Korean version of the GPAQ were examined in a previous study.[20] We added a measure of walking and its frequency and duration, which is not included in the original GPAQ but is relevant to the current study.

**Trustworthiness**

To increase the trustworthiness of data,[21] we have employed three different methods: reflective note, observation, and member check. After each interview, the exercise specialist reflected on their performance as an interviewer. Mistakes and important lessons learnt were recorded in a reflective note, and methods to improve the quality of future interviews were practiced before the next interview. A sufficient amount of time was spent observing participants' physical performance and symptoms including: shoulder ROM, strength, pain, and other medical treatment. To increase the reliability of the findings, interviews were conducted three times over four weeks as participants underwent treatment. The transcript and summary of each interview were confirmed by the participants to ensure the transcriptions and summaries correctly reflected what they intended to express.

**Analysis**

Guided by the Grounded Theory,[22] the team started with open coding, identifying the themes that emerged from the transcripts. In addition, the field notes were included in the analysis to avoid loss of non-verbal information. Immediately after the team agreed on the first

group of themes collectively, the authors worked on the subsequent transcripts individually. The team conducted regular meetings and worked on abstracting the codes and then the categories to proceed to the selective coding collectively. During the constant comparative analysis, member checking was performed to increase the validity of the analysis. The analysis results were sent to three randomly selected interviewees to confirm the meaning and nuance of answers, and thereby, their experience as breast cancer survivors.

Complementary quantitative data analysis was performed using a repeated measures analysis of variance to compare the means of total PA total and walk, before surgery and during the first, second, and third interview. To determine whether total PA and walk time is different from baseline presurgery levels, paired t-test was used.

## RESULTS

### Participant Description

The characteristics of the 33 participants are presented in Table 2. Characteristics such as age, weight, surgery type, cancer stage, dominant arm, operation side, post-operative day (POD, from 1 through 30 days), and whether they had neo-adjuvant chemotherapy were analyzed.

Table 2. Characteristics of the participants

| ID | Age Range (years) | Type of Surgery | Cancer Stage |
|---|---|---|---|
| 1 | 60-64 | TM/SLNB | 1A |
| 2 | 55-59 | TM/SLNB | 0 |
| 3 | 50-54 | TM/SLNB | 2A |
| 4 | 35-39 | TM/ALND | 3A |
| 5 | 55-59 | TM/ALND | 1A |
| 6 | 55-59 | TM/ALND | 2B |
| 7 | 65-69 | PM/SLNB | 1A |
| 8 | 50-54 | PM/SLNB | 1A |
| 9 | 40-44 | PM/SLNB | 1A |
| 10 | 45-49 | PM/ALND | 2A |

| | | | |
|---|---|---|---|
| 11 | 50-54 | PM/ALND | 1A |
| 12 | 55-59 | PM/ALND | 0 |
| 13 | 60-64 | PM/SLNB | 0 |
| 14 | 65-69 | PM/SLNB | 1A |
| 15 | 60-64 | PM/SLNB | 1A |
| 16 | 45-49 | PM/SLNB | 1A |
| 17 | 35-39 | PM/SLNB | 0 |
| 18 | 60-64 | PM/SLNB | 1A |
| 19 | 60-64 | PM/ALND | 1B |
| 20 | 55-59 | TM/SLNB | 1A |
| 21 | 65-69 | TM/SLNB | 1A |
| 22 | 50-54 | TM/SLNB | 1A |
| 23 | 65-69 | TM/SLNB | 0 |
| 24 | 60-64 | TM/SLNB | 1A |
| 25 | 40-44 | TM/SLNB | 0 |
| 26 | 60-64 | TM/ALND | 1A |
| 27 | 65-69 | TM/SLNB | 1A |
| 28 | 50-54 | PM/ALND | 2A |
| 29 | 60-64 | PM/ALND | 3A |
| 30 | 55-59 | TM/SLNB | 1A |
| 31 | 55-59 | TM/ALND | 2B |
| 32 | 35-39 | PM/ALND | 2A |
| 33 | 40-44 | PM/SLNB | 1A |

ALND, axillary lymph node dissection; N, No; PM, partial mastectomy; POD, post-operative day; SLNB, sentinel lymph node biopsy; TM, total mastectomy; Y, Yes.

***Intervention Needed in Time for Physical Recovery***

The interviewees identified multiple factors that either facilitated participants to exercise more or hindered them from exercising after BCS. Out of the 44 themes that emerged from the interviews, 10 codes and 5 categories were identified (Table 3). Physical constraints and psychological resistance were identified as the barriers for exercise, whereas the sense of purpose and first-hand exercise experience were identified as the facilitators for exercise during the early stage of rehabilitation after BCS. The overwhelming physical constraints that produced psychological resistance in the earlier weeks after surgery appeared to be gradually substituted by the sense of purpose that derived from the first-hand experience encouraged by diverse sources. This conclusion is consistent with the PA data: the motivation to perform exercise and PA materialized with time (Table 4). Quantitative data of 31 participants were collected and analyzed with repeated measure analysis of variance, which revealed that the

total PA level statistically significantly increased over time ($F = 3.64$, $p < .05$). The supportive intervention that reflects an individual patient's physical condition can expedite the substitution process, if conducted properly. Our analyses revealed the core variable that answered our research questions was "*intervention needed* in time for physical recovery" to meet the varying needs of the survivors according to the time after BCS (Figure 1).

Table 3. Themes, codes, and categories from the interviews

| **Categories** | **Codes** | **Themes** |
|---|---|---|
| Physical constraints | Postoperative syndrome | Lymphedema, seroma |
| | | Pain |
| | | Limited mobility of the arm |
| | | Feeling weak |
| | Operation-derived condition | Drain |
| | Non-operation-derived condition | Neoadjuvant therapy |
| | | Pre-existing physical condition |
| Psychological resistance | Perception and attitude | Believing that daily living activities are sufficient |
| | | Unaware of the requirement of exercise |
| | | Exercise not prioritized |
| | | Not wanting to burden the body |
| | | Lack of self-efficacy regarding exercise |
| | | Psychological withdrawal |
| | Concerns from the lack of accurate information | Concerns regarding the potential side-effects of exercise |
| | | Concerns regarding injuries |
| | | Concerns regarding the timing being inappropriate |
| | | Concerns regarding the etiology and symptoms of the cancer – related to exercise |
| | | Own theory regarding the etiology and the symptoms of the cancer – related to exercise |
| Sense of purpose | Encouragement and support | From family |
| | | From medical professionals |
| | | From exercise therapists |
| | | From other cancer patients |
| | | From media |
| | Expected benefits | Speed up the recovery |
| | | Recover from the postoperative syndrome |
| | | Health management |

| | | |
|---|---|---|
| | | Muscular strength |
| | | Increase muscle mass |
| | | Improve flexibility |
| | | Prevent relapse by promoting health |
| | | General physical health |
| | | Break unhealthy lifestyle |
| | | Prevent weight gain |
| | | Maintain healthy lifestyle |
| First-hand experience | Benefits of exercise | Reduced pain |
| | | Promoted flexibility |
| | | Increased amount of exercise |
| | | Increased physical activities |
| | | Reduced discomforts |
| | | Expedited recovery |
| | Heightened sense of purpose | Attribution of cancer to the lack of exercise |
| | | Want to exercise more |
| Intervention needed | Accurate information and education | Want consultation regarding symptoms |
| | | Want information/education in accordance with the proper timing |

Table 4. The change of physical activity level (pre-surgery to 4 weeks post-surgery)

| | Before surgery *M (SD)* | 1st interview *M (SD)* | 2nd interview *M (SD)* | 3rd interview *M (SD)* | *p* for time |
|---|---|---|---|---|---|
| VPA (min/week) | 0 | 0 | 0 | 0 | N/A |
| MPA (min/week) | 41.0 (113.4) | 0 | 0 | 12.3 (54.1) | 0.07 |
| Total PA (min/week) | 142.6 (167.6) | 49.8 (61.6)* | 96.1 (175.4) | 142.6 (161.9) | 0.02 |
| Walk (min/week) | 204.4 (208.0) | 142.1 (165.3) | 173.1 (139.1) | 222.9 (166.4) | 0.1 |

Total physical activity = (minutes of MVPA at week) + (minutes of leisure-time MVPA) + (minutes of transportation PA), Abbreviation: M (SD), mean (standard deviation); PA, physical activity; VPA, vigorous physical activity, MPA moderate physical activity. *$p$ value < 0.05 versus baseline Total PA

**Barriers to Exercise**

*Physical Constraints*. Breast cancer patients who underwent surgery experienced multiple types of physical restraints, which made it difficult for them to participate in or even think about exercise. The most frequently reported barrier to exercise was pain, followed by limited shoulder ROM, and frequent by-products of the treatment including seroma and the drain attached to the body. All these contributed to a perception of weakness throughout the body, especially among those who received neo-adjuvant chemotherapy.

> *"I couldn't exercise after the surgery. I am not eating well and do not feel strong. It's not just my arm that feels weak; my whole body feels weak. I lay inert or just sat leaning on something, most of the time."* (Participant #19, PM/ALND, first interview)

> *"(After the drain was removed) This (seroma) started leaking and I felt so distressed. It stressed me out. Only a few drops, you know, when it leaks, are enough to feel so awkward. Thinking about it, I couldn't exercise. This past week was more uncomfortable."* (Participant #19, PM/ALND, third interview)

*Psychological Resistance.* These physical constraints discouraged participants from exercising because they believed that "physical activities may be harmful or at least drain their energy." Moreover, although their physical condition permitted exercise, participants did not feel enough motivation to exercise. In some cases, anxiety regarding possible injuries overcame their wish to become more physically active. Other times, they excused themselves from doing more exercise as "daily living and house chores are good enough exercise." In addition to these concerns and excuses, their pre-existing perception of the inefficacy of exercise appeared to discourage them from exercising after surgery.

> *"Well, I didn't do much. I couldn't exercise at all because of the pain. The armpit feels tight and poking. What if moving causes more pain? Worried about it,*

*I can't exercise.."* (Participant #27, TM/SLNB, third interview)

*"I couldn't exercise… Well, I thought of looking over the booklet (of exercise education), but didn't. I don't recall why I didn't, but time passed while I was taking care of my grandkids. I put it on the dining table and didn't reach for it later. I did try stretching my arm lying down on the bed. It wasn't painful though."* (Participant #13, PM/SLNB, first interview)

Notwithstanding, the lack of accurate information was identified as a significant reason for the patients not take courage to exercise. After surgery, considering all the byproducts of operation, whether anticipated or unanticipated, patients' anxiety was not ungrounded. Accurate information regarding the types of activities and exercises that speed up the recovery from diverse postoperative symptoms was important.

*"Well, I can't find the information I need.. when should I work on muscles, when can I jog or run.. I don't know.."* (Participant #33, PM/SLNB, first interview)

Often, different health professionals such as surgeons, medical oncologists, physiatrists, and plastic surgeon (in case patients underwent breast reconstruction) provided varying information on when and how to exercise. Lack of information or inconsistent information was the barrier to exercise for breast cancer patients.

**Facilitators of Exercise**

*Accurate Information*. Accurate information on exercise according to the time after surgery was identified as the key facilitator to promote exercise among patients. The patients expressed their wish to have some professional consultation regarding exercise interventions that take their symptoms and health conditions into account.

*Encouragement and Support*. In the process of recovery after BCS, patients reported social support as an important factor that motivated them to exercise more. Diverse sources

worked, including medical professionals, exercise therapists, friends, family members, as well as fellow cancer patients.

*"(Other patients in this rehab center says) You have to exercise. Otherwise, it'll become stiff. Those who have experienced something like myself informed me to do this and that, even regarding how to wash up. It's a great help from these folks who have been or are going through the similar experiences (treatment processes).. It's good."* (Participant #28, PM/ALND, third interview)

*First-hand Experience*. The participants reported their first-hand experience as an important motivator for exercise. They increased the activity level and exercised more after knowing the positive effects of exercise through experience.

*"The more I exercise, the larger this angle becomes. It was really hard to follow the instructions when I wasn't working out. The more I tried, however, the easier it became. So I realized the importance (of exercise). If I do not exercise, it will be harder. So whenever it pops up in my mind, I try to do some exercise. Even in waking up, I tried to do some arm stretching."* (Participant #24, TS/SLNB, second interview)

*Sense of Purpose*. All the aforementioned factors contributed to the patients' sense of purpose, expecting the benefits of exercise. The expectation included pain reduction, fast recovery, relapse prevention, and health management. The patients who had mastectomy tried to motivate themselves to exercise more. In addition, they frequently expressed their wish to increase physical strength, muscle mass, and flexibility, as well as to maintain a healthy lifestyle.

*"(People say) It takes 3 months to recover from the surgery, but recovery is up to me, I figure. Exercising and building muscles are up to me. So I do exercise."* (Participants #2, TM/SLNB, third interview)

*"I think I got cancer because I had not exercised… There's no other reason. You know, there's no known cause for the triple negative breast cancer.. I guess it's from me not exercising… So I do exercise now, do walking at least."*

(Participant #9, PM /SLNB, second interview)

**Impact of Timing**

During the current study, the participants showed a certain pattern related to the time after BCS. Diverse factors contributed to the heightened psychological resistance, resulting in no or minimal exercise, in the early weeks after BCS. However, with the time and support of professional and social contacts, the patients expressed an increased sense of the purpose of exercise. Support from external sources, as well as own first-hand experience, produced this sense of purpose. The motivation along with proper instruction of tailored exercise intervention is projected to offset the psychological resistance in the early weeks after BCS (Figure 1). This pattern is consistent with the participants' actual amount of PA participation, which increased gradually from immediately after surgery to four weeks after surgery (Table 4).

**DISCUSSION**

**Summary of Results**

We employed an in-depth interview technique among breast cancer survivors within one month after BCS and identified the key barriers and facilitators of exercise. Physical constraints that were prominent in the early weeks, as reported in the literature,[23, 24] along with the pre-existing perception and attitude toward exercise developed psychological resistance to exercise among the patients. However, an increase in motivation to exercise was observed among patients in later weeks due to more encouragement from others, as was reported in other studies,[25-27] and higher sense of purpose from their own experience.

This process of increasing the sense of purpose, replacing the psychological resistance, seemed to be propelled by professional intervention conducted at the right time with the correct

exercise. All participants agreed that more accurate information and education were required to promote exercise. Multiple physical, psychological, and environmental circumstances served as conditions for psychological resistance among patients. The resistance grounded on the anxiety and fear of unintended injuries and unanticipated side-effects as a cancer survivor can only be overcome through professional diagnosis and exercise prescription. The complementary PA data revealed that patients' sense of purpose was positively associated with their actual amount of PA participation, reinforcing the requirement for professional intervention at the right time.

**Study Limitations and Strengths**

This qualitative study included only 33 participants. Hence, generalization of the results to all breast cancer survivors should be made with caution. Considering that the recruiting site was one of the major tertiary hospitals in Korea, the lived experiences of people living in rural areas or those treated in smaller hospitals, for instance, could not be captured in the current study. Therefore, to advance our understanding regarding the professional intervention that was identified as the key factor to promote exercise among the participants, a randomized control study should be performed. The long-term and short-term physical as well as psychological benefits of exercise can be examined more comprehensibly by investigating the effects of exercise intervention, preferably in a longitudinal study.

The strengths of the current study included repeated interviews over four weeks after surgery which enabled us to observe the change in patients' attitude toward exercise over time. Especially, in the current study, breast cancer patients were interviewed from only one week after surgery before implementation of exercise or rehabilitation intervention; however, recent studies have reported the importance of early exercise intervention after surgery in cancer patients.

**Clinical Implications**

To mitigate the constant feedback loop between physical and psychological excuses, a tailored exercise intervention, considering patients physical and psychological conditions, should be designed. Considering the diverse anxiety expressed in the current study, tailored programs should consider each patient's physical and psychological needs to optimize the potential effects of the program.

Many breast cancer patients do not participate in PA and experience significant muscle mass loss during the first few months after surgery, which is associated with increased risk of type 2 diabetes and worse prognosis, including increased risk of recurrence.[28, 29] The findings of the current study revealed that breast cancer patients can benefit from early participation of exercise and PA, which may prevent loss of shoulder ROM and strength after BCS. Therefore, the importance of exercise needs to be emphasized and educated, not only among the patients but also among the health care professionals so that their recommendations to the patients can have real impact in changing motivation as well as behavior. In addition, the current study provides information regarding the attitude of breast cancer patients toward exercise during the early recovery stage after surgery and thus, promotes the development of appropriate intervention strategies.

**Conclusions**

Thirty-three breast cancer survivors shared their experience and thoughts regarding exercise after BCS. Commonly expressed needs of the participants were summed as a professional intervention that takes into account the time after surgery and each individual's physical condition. Exercise was not only a matter of motivation and will power, but also a matter of resources that can be used with physical and psychological comfort.

## Contributorship statement

SJY and JYJ participated in study design. SJY, JHM, JYK, SIK and JYJ participated in data collection. SJY, ASJ, JHM, JYB, JYK, SHP, SIK and JYJ participated in data analysis and interpretation. ASJ, SJY, CWL, YJY, JMH and JYJ participated in the manuscript writing. All authors participated in the manuscript review and revision. All authors thank participants of the study and research coordinators at the Yonsei Cancer Center.

## Competing interests

None declared.

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## Data sharing statement

Data are available upon reasonable request. Interview transcripts will be available upon request on the specific area of interest.

Figure 1. Relations among categories according to time, which changes the weight of the barriers and facilitators of exercise

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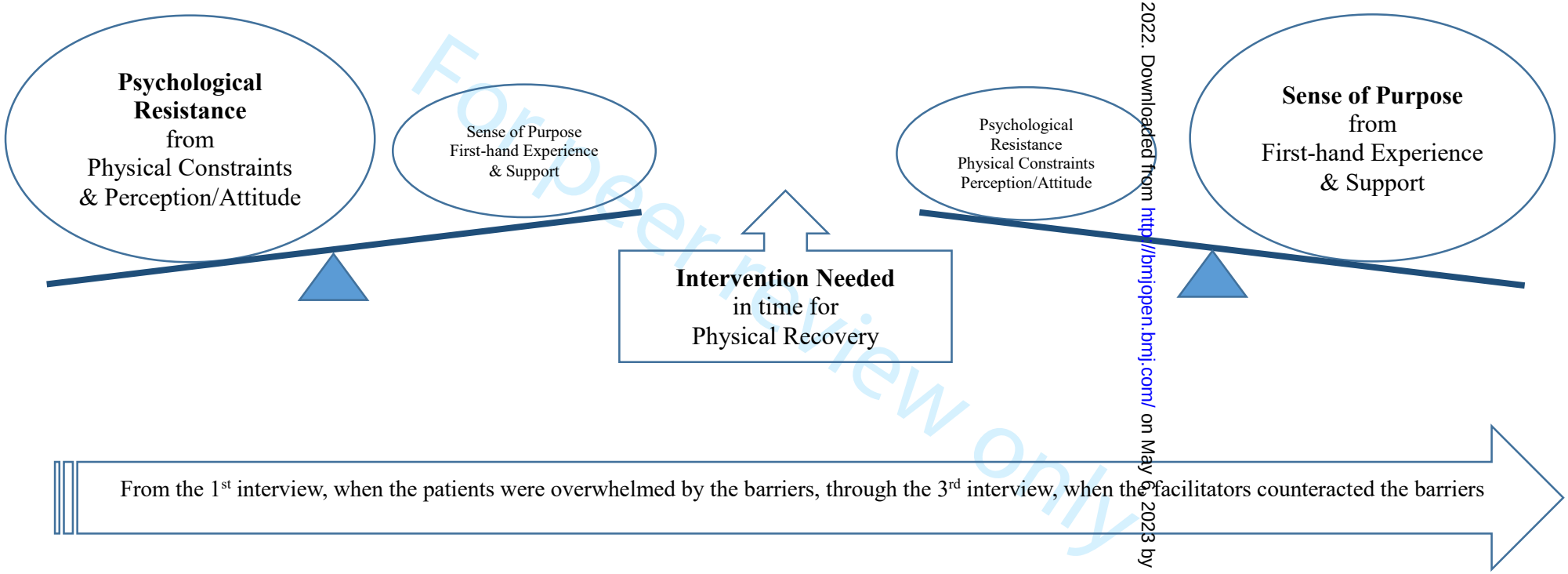
Figure 1. Relations among categories according to time, which changes the weight of the barriers and facilitators of exercise



# COREQ (COnsolidated criteria for REporting Qualitative research) Checklist

A checklist of items that should be included in reports of qualitative research. You must report the page number in your manuscript where you consider each of the items listed in this checklist. If you have not included this information, either revise your manuscript accordingly before submitting or note N/A

| Topic | Item No. | Guide Questions/Description | Reported on Page No. |
|---|---|---|---|
| **Domain 1: Research team and reflexivity** | | | |
| *Personal characteristics* | | | |
| Interviewer/facilitator | 1 | Which author/s conducted the interview or focus group? | 7 |
| Credentials | 2 | What were the researcher's credentials? e.g. PhD, MD | 1 |
| Occupation | 3 | What was their occupation at the time of the study? | 7 |
| Gender | 4 | Was the researcher male or female? | - |
| Experience and training | 5 | What experience or training did the researcher have? | 7 |
| *Relationship with participants* | | | |
| Relationship established | 6 | Was a relationship established prior to study commencement? | 5 |
| Participant knowledge of the interviewer | 7 | What did the participants know about the researcher? e.g. personal goals, reasons for doing the research | -- |
| Interviewer characteristics | 8 | What characteristics were reported about the inter viewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic | 7 |
| **Domain 2: Study design** | | | |
| *Theoretical framework* | | | |
| Methodological orientation and Theory | 9 | What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis | 8 |
| *Participant selection* | | | |
| Sampling | 10 | How were participants selected? e.g. purposive, convenience, consecutive, snowball | 5 |
| Method of approach | 11 | How were participants approached? e.g. face-to-face, telephone, mail, email | 5 |
| Sample size | 12 | How many participants were in the study? | 5 |
| Non-participation | 13 | How many people refused to participate or dropped out? Reasons? | 5 |
| *Setting* | | | |
| Setting of data collection | 14 | Where was the data collected? e.g. home, clinic, workplace | 6 |
| Presence of non-participants | 15 | Was anyone else present besides the participants and researchers? | 6 |
| Description of sample | 16 | What are the important characteristics of the sample? e.g. demographic data, date | Table2 |

| Topic | Item No. | Guide Questions/Description | Reported on Page No. |
|---|---|---|---|
| *Data collection* | | | |
| Interview guide | 17 | Were questions, prompts, guides provided by the authors? Was it pilot tested? | Table1 |
| Repeat interviews | 18 | Were repeat interviews carried out? If yes, how many? | 6 |
| Audio/visual recording | 19 | Did the research use audio or visual recording to collect the data? | 6 |
| Field notes | 20 | Were field notes made during and/or after the interview or focus group? | 6 |
| Duration | 21 | What was the duration of the interviews or focus group? | 6 |
| Data saturation | 22 | Was data saturation discussed? | 5 |
| Transcripts returned | 23 | Were transcripts returned to participants for comment and/or correction? | 7-8 |
| **Domain 3: analysis and findings** | | | |
| *Data analysis* | | | |
| Number of data coders | 24 | How many data coders coded the data? | 8 |
| Description of the coding tree | 25 | Did authors provide a description of the coding tree? | Table 3 |
| Derivation of themes | 26 | Were themes identified in advance or derived from the data? | 8 |
| Software | 27 | What software, if applicable, was used to manage the data? | N/A |
| Participant checking | 28 | Did participants provide feedback on the findings? | 7-8 |
| *Reporting* | | | |
| Quotations presented | 29 | Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number | 12-15 |
| Data and findings consistent | 30 | Was there consistency between the data presented and the findings? | 8-15 |
| Clarity of major themes | 31 | Were major themes clearly presented in the findings? | 8-15 Table 3 |
| Clarity of minor themes | 32 | Is there a description of diverse cases or discussion of minor themes? | 15-16 Table 3 |

Developed from: Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32 item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. 2007. Volume 19, Number 6: pp. 349–35

BMJ Open

# Tearing down the barriers to exercise after mastectomy: A qualitative inquiry to facilitate exercise among breast cancer survivors

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# Tearing down the barriers to exercise after mastectomy: A qualitative inquiry to facilitate exercise among breast cancer survivors

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All the authors have no conflict of interest to declare.

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## Abstract

*Objective*. Proper exercise immediately after breast cancer surgery (BCS) may prevent unnecessary physical and psychological decline resulting from surgery; however, patients' attitude, barriers, and facilitators for exercise during this period have not been studied. Hence, the current study explored the barriers and facilitators of exercise among breast cancer patients through multiple interviews immediately after surgery through 4 weeks after BCS.

*Methods*. We conducted three in-depth interviews of 33 breast cancer patients within one month after BCS.

*Results*. We identified 44 themes, 10 codes, and 5 categories from interview results. Physical constraints and psychological resistance were identified as the barriers to exercise, while a sense of purpose and first-hand exercise experience were identified as the facilitators of exercise. By conducting the interviews over the course of 4 weeks after surgery, we monitored patterns of changes in barriers and facilitators over time. Overall, our analyses identified that professional intervention based on the time since surgery and the physical state after BCS is essential. The intervention would counteract the overwhelming psychological resistance in the early weeks by developing a sense of purpose in the later weeks.

*Conclusions*. We made suggestions for future research and exercise intervention programs that can benefit breast cancer survivors based on the categories, codes, and themes identified in the current study.


**Keywords:** barriers to exercise; breast cancer; cancer survivors; exercise intervention; exercise promotion; facilitators of exercise; professional support

## Strengths and Limitations

- The participants were recruited immediately after the breast cancer surgery and shared their experiences regarding multiple factors.

- To examine the effect of time, multiple interviews were conducted from immediately after surgery up to one month after surgery.
- This study was conducted at the tertiary hospital in South Korea and generalization of the findings from the current study to other regions and countries should be made careful.

## BACKGROUND

The incidence of breast cancer has been continually increasing. Currently, breast cancer is the most common cancer among women, accounting for 24.2% of the cases worldwide and 20.3% of the cases in South Korea.[1] Although the 5-year survival rate of breast cancer is over 90 % for Stage 0-2 breast cancer patients in South Korea, a substantial number of breast cancer patients experience breast cancer recurrence and suffer heavily from side effects of cancer treatments.[2] Although the rate of breast-conserving surgery has increased from 37.6% in 2002 to 67.4% in 2017, many breast cancer patients develop both short-term and long-term physical impairments such as lymphedema, decreased shoulder strength, and range of motion (ROM).[3-6] In addition to physical impairment, the prevalence of depression, distress, anger, and social isolation is high among breast cancer survivors.[7]

Exercise and physical activity (PA) improve the prognosis of breast cancer (e.g., decrease breast cancer-specific and all-cause mortality).[8] The benefit of exercise among breast cancer patients is not limited to improvement in survival. Early implementation of exercises has been shown to reduce surgery-related complications,[9] pain,[10] and risk of lymphedema[11]. Exercises such as shoulder ROM exercise and isometric and passive stretching shortly after surgery could improve shoulder ROM during early recovery after surgery.[12]

Although ample evidence exists on the benefits of exercise on recovery after breast cancer surgery (BCS),[13] breast cancer patients are reluctant to participate in exercise during early recovery. Furthermore, few studies have investigated the attitude toward exercise and exercise experience, barriers, and facilitators over an extended period of time, particularly immediately after BCS until 4 weeks after surgery. A few qualitative studies have investigated these factors in cancer survivors after a few months of surgery[14-16]. Considering the various different needs of the breast cancer survivors depending on the time post-surgery, more information on the barriers and facilitators of exercise immediately after BCS can potentially

be useful in tailoring exercise intervention programs to the specific needs of breast cancer survivors.

In these regards, the current study investigated the factors related to exercise promotion within one month after BCS. More specifically, by employing the in-depth interview method, the study investigated: (1) the barriers and the facilitators of exercise for breast cancer survivors; (2) the changes in these factors according to time after BCS. Additionally, the current study aimed to complement the intentions expressed in the interviews with the actual behaviors based on the quantitative data on PA.

## METHODS

### Participants

We recruited 33 women who underwent BCS at the breast cancer center of a university medical center in Seoul, Korea, between February 14, 2019 and November 12, 2019, using the criterion sampling technique.[17] Patients who were over 70 years old, had undergone bilateral or reconstruction surgery, or had a history of previous cancer were excluded. The recruitment of new participants was stopped when new data from additional participants did not add new ideas or concepts related to the purpose of the study.[18]

### Procedures

Potential participants who met all the inclusion criteria were contacted by the physician to explain the research participation opportunity. Patients who agreed to participate in multiple interviews after BCS signed the informed consent. The same procedure was repeated until the saturation point.[17] Three of 36 participants withdrew (one patient dropped out because of re-surgery and the other two refused to participate); thus, 33 patients participated in the current study.

The research participants met with the first author of the current study one day before BCS, to build a collaborative relationship between the researcher and the participant. After

BCS, the interview was conducted three times during clinic visits: first interview within two weeks after surgery; second interview between two and three weeks after surgery; and third interview between three weeks and one month after surgery. All interviews were conducted one-on-one in Korean. With the participants' permission, the interviews were audio-recorded and transcribed verbatim, with two different semi-structured interview questionnaires (Table 1). Only after all the three interviews were completed, a professional exercise consultation was provided as a compensation for research participation, not as a component of this study.

Table 1. Interview questionnaires

| Interview | Questions |
|---|---|
| 1st | • How is the surgery site?<br>• Are there any functional changes in your arm?<br>• Are there any changes in your daily-living activities such as doing chores, putting clothes on, and washing dishes?<br>• Did you exercise during the past week (after surgery)?<br>  • If yes, how often? Why did you exercise?<br>  • If no, why did you not exercise? |
| 2nd and 3rd | • Compared to the last week, is there any change at the surgery site?<br>• Compared to the last week, are there any changes in your activities of daily living?<br>• Did you exercise during the past week (after surgery)?<br>  • If yes, how often? Why did you exercise?<br>  • If no, why did you not exercise? |
| 3rd | • Could you specify the biggest barriers and facilitators of exercise for the past month?<br>• Would you like say anything to other breast cancer survivors? |

The complementary measurement of the participants' PA level was performed during each interview using the Global PA Questionnaire (GPAQ), developed by the World Health Organization (WHO).[19] The GPAQ comprises 16 items in four domains of PA: work, leisure time, transportation, and sedentary behavior. The reliability and validity of the Korean version of the GPAQ were examined in a previous study.[20] We added a measure of walking and its frequency and duration, which is not included in the original GPAQ but is relevant to the

current study.

**Ethics Approval Statement**

This study was approved by the Institutional Review Board of the hospital (IRB No. 4-2018-1094). All participants provided written informed consent and agreed to be interviewed multiple times within one month after BCS.

**Trustworthiness**

To increase the trustworthiness of data,[21] we have employed three different methods: reflective note, observation, and member check. After each interview, the exercise specialist reflected on their performance as an interviewer. Mistakes and important lessons learnt were recorded in a reflective note, and methods to improve the quality of future interviews were practiced before the next interview. A sufficient amount of time was spent observing participants' physical performance and symptoms, including shoulder ROM, strength, pain, and other medical treatment. To increase the reliability of the findings, interviews were conducted three times over four weeks as participants underwent treatment. The transcript and summary of each interview were confirmed by the participants to ensure the transcriptions and summaries correctly reflected what they intended to express.

**Analysis**

Guided by the Grounded Theory,[22] the team started with open coding, identifying the themes that emerged from the transcripts. In addition, the field notes were included in the analysis to avoid loss of non-verbal information. Immediately after the team agreed on the first group of themes collectively, the authors worked on the subsequent transcripts individually. The team conducted regular meetings and worked on abstracting the codes and then the categories to proceed to the selective coding collectively. During the constant comparative analysis, member checking was performed to increase the validity of the analysis. The analysis results were sent to three randomly selected interviewees to confirm the meaning and nuance

of answers, and thereby, their experience as breast cancer survivors.

Complementary quantitative data analysis was performed using a repeated measures analysis of variance to compare the means of total PA total and walk, before surgery and during the first, second, and third interview. To determine whether total PA and walk time is different from baseline presurgery levels, paired t-test was used.

**Patient and Public Involvement**

The research team developed the research question grounded on the previous experiences with people who underwent BCS. The understanding led the research team to employing qualitative approach with multiple in-depth interviews for an extended period of time. By adopting member-checking process, the team ensured the involvement of the participants in the analysis stage as well. The publication of this research will help disseminate the results to the public.

**RESULTS**

**Participant Description**

The characteristics of the 33 participants are presented in Table 2. Characteristics such as age, weight, surgery type, cancer stage, dominant arm, operation side, post-operative day (POD, from 1 through 30 days), and whether they had neo-adjuvant chemotherapy were analyzed.

Table 2. Characteristics of the participants

| ID | Age Range (years) | Type of Surgery | Cancer Stage |
|---|---|---|---|
| 1 | 60-64 | TM/SLNB | 1A |
| 2 | 55-59 | TM/SLNB | 0 |
| 3 | 50-54 | TM/SLNB | 2A |
| 4 | 35-39 | TM/ALND | 3A |
| 5 | 55-59 | TM/ALND | 1A |
| 6 | 55-59 | TM/ALND | 2B |
| 7 | 65-69 | PM/SLNB | 1A |
| 8 | 50-54 | PM/SLNB | 1A |

| | | | |
|---|---|---|---|
| 9 | 40-44 | PM/SLNB | 1A |
| 10 | 45-49 | PM/ALND | 2A |
| 11 | 50-54 | PM/ALND | 1A |
| 12 | 55-59 | PM/ALND | 0 |
| 13 | 60-64 | PM/SLNB | 0 |
| 14 | 65-69 | PM/SLNB | 1A |
| 15 | 60-64 | PM/SLNB | 1A |
| 16 | 45-49 | PM/SLNB | 1A |
| 17 | 35-39 | PM/SLNB | 0 |
| 18 | 60-64 | PM/SLNB | 1A |
| 19 | 60-64 | PM/ALND | 1B |
| 20 | 55-59 | TM/SLNB | 1A |
| 21 | 65-69 | TM/SLNB | 1A |
| 22 | 50-54 | TM/SLNB | 1A |
| 23 | 65-69 | TM/SLNB | 0 |
| 24 | 60-64 | TM/SLNB | 1A |
| 25 | 40-44 | TM/SLNB | 0 |
| 26 | 60-64 | TM/ALND | 1A |
| 27 | 65-69 | TM/SLNB | 1A |
| 28 | 50-54 | PM/ALND | 2A |
| 29 | 60-64 | PM/ALND | 3A |
| 30 | 55-59 | TM/SLNB | 1A |
| 31 | 55-59 | TM/ALND | 2B |
| 32 | 35-39 | PM/ALND | 2A |
| 33 | 40-44 | PM/SLNB | 1A |

ALND, axillary lymph node dissection; N, No; PM, partial mastectomy; POD, post-operative day; SLNB, sentinel lymph node biopsy; TM, total mastectomy; Y, Yes.

***Intervention Needed in Time for Physical Recovery***

The interviewees identified multiple factors that either facilitated participants to exercise more or hindered them from exercising after BCS. Out of the 44 themes that emerged from the interviews, 10 codes and 5 categories were identified (Table 3). Physical constraints and psychological resistance were identified as the barriers for exercise, whereas the sense of purpose and first-hand exercise experience were identified as the facilitators for exercise during the early stage of rehabilitation after BCS. The overwhelming physical constraints that produced psychological resistance in the earlier weeks after surgery appeared to be gradually substituted by the sense of purpose that derived from the first-hand experience encouraged by diverse sources. This conclusion is consistent with the PA data: the motivation to perform exercise and PA materialized with time (Table 4). Quantitative data of 31 participants were

collected and analyzed with repeated measure analysis of variance, which revealed that the total PA level statistically significantly increased over time ($F = 3.64$, $p < .05$). The supportive intervention that reflects an individual patient's physical condition can expedite the substitution process, if conducted properly. Our analyses revealed the core variable that answered our research questions was "*intervention needed* in time for physical recovery" to meet the varying needs of the survivors according to the time after BCS (Figure 1).

Table 3. Themes, codes, and categories from the interviews

| **Categories** | **Codes** | **Themes** |
|---|---|---|
| Physical constraints | Postoperative syndrome | Lymphedema, seroma |
| | | Pain |
| | | Limited mobility of the arm |
| | | Feeling weak |
| | Operation-derived condition | Drain |
| | Non-operation-derived condition | Neoadjuvant therapy |
| | | Pre-existing physical condition |
| Psychological resistance | Perception and attitude | Believing that daily living activities are sufficient |
| | | Unaware of the requirement of exercise |
| | | Exercise not prioritized |
| | | Not wanting to burden the body |
| | | Lack of self-efficacy regarding exercise |
| | | Psychological withdrawal |
| | Concerns from the lack of accurate information | Concerns regarding the potential side-effects of exercise |
| | | Concerns regarding injuries |
| | | Concerns regarding the timing being inappropriate |
| | | Concerns regarding the etiology and symptoms of the cancer – related to exercise |
| | | Own theory regarding the etiology and the symptoms of the cancer – related to exercise |
| Sense of purpose | Encouragement and support | From family |
| | | From medical professionals |
| | | From exercise therapists |
| | | From other cancer patients |
| | | From media |
| | Expected benefits | Speed up the recovery |

| | | |
|---|---|---|
| | | Recover from the postoperative syndrome |
| | | Health management |
| | | Muscular strength |
| | | Increase muscle mass |
| | | Improve flexibility |
| | | Prevent relapse by promoting health |
| | | General physical health |
| | | Break unhealthy lifestyle |
| | | Prevent weight gain |
| | | Maintain healthy lifestyle |
| First-hand experience | Benefits of exercise | Reduced pain |
| | | Promoted flexibility |
| | | Increased amount of exercise |
| | | Increased physical activities |
| | | Reduced discomforts |
| | | Expedited recovery |
| | Heightened sense of purpose | Attribution of cancer to the lack of exercise |
| | | Want to exercise more |
| Intervention needed | Accurate information and education | Want consultation regarding symptoms |
| | | Want information/education in accordance with the proper timing |

Table 4. The change of physical activity level (pre-surgery to 4 weeks post-surgery)

| | Before surgery *M (SD)* | 1st interview *M (SD)* | 2nd interview *M (SD)* | 3rd interview *M (SD)* | *p* for time |
|---|---|---|---|---|---|
| VPA (min/week) | 0 | 0 | 0 | 0 | N/A |
| MPA (min/week) | 41.0 (113.4) | 0 | 0 | 12.3 (54.1) | 0.07 |
| Total PA (min/week) | 142.6 (167.6) | 49.8 (61.6)* | 96.1 (175.4) | 142.6 (161.9) | 0.02 |
| Walk (min/week) | 204.4 (208.0) | 142.1 (165.3) | 173.1 (139.1) | 222.9 (166.4) | 0.1 |

Total physical activity = (minutes of MVPA at week) + (minutes of leisure-time MVPA) + (minutes of transportation PA), Abbreviation: M (SD), mean (standard deviation); PA, physical activity; VPA, vigorous physical activity, MPA moderate physical activity. *$p$ value < 0.05 versus baseline Total PA

**Barriers to Exercise**

*Physical Constraints*. Breast cancer patients who underwent surgery experienced multiple types of physical restraints, which made it difficult for them to participate in or even think about exercise. The most frequently reported barrier to exercise was pain, followed by limited shoulder ROM, and frequent by-products of the treatment including seroma and the drain attached to the body. All these contributed to a perception of weakness throughout the body, especially among those who received neo-adjuvant chemotherapy.

> *"I couldn't exercise after the surgery. I am not eating well and do not feel strong. It's not just my arm that feels weak; my whole body feels weak. I lay inert or just sat leaning on something, most of the time."* (Participant #19, PM/ALND, first interview)

> *"(After the drain was removed) This (seroma) started leaking and I felt so distressed. It stressed me out. Only a few drops, you know, when it leaks, are enough to feel so awkward. Thinking about it, I couldn't exercise. This past week was more uncomfortable."* (Participant #19, PM/ALND, third interview)

*Psychological Resistance.* These physical constraints discouraged participants from exercising because they believed that "physical activities may be harmful or at least drain their energy." Moreover, although their physical condition permitted exercise, participants did not feel enough motivation to exercise. In some cases, anxiety regarding possible injuries overcame their wish to become more physically active. Other times, they excused themselves from doing more exercise as "daily living and house chores are good enough exercise." In addition to these concerns and excuses, their pre-existing perception of the inefficacy of exercise appeared to discourage them from exercising after surgery.

> *"Well, I didn't do much. I couldn't exercise at all because of the pain. The*

*armpit feels tight and poking. What if moving causes more pain? Worried about it, I can't exercise.."* (Participant #27, TM/SLNB, third interview)

*"I couldn't exercise… Well, I thought of looking over the booklet (of exercise education), but didn't. I don't recall why I didn't, but time passed while I was taking care of my grandkids. I put it on the dining table and didn't reach for it later. I did try stretching my arm lying down on the bed. It wasn't painful though."* (Participant #13, PM/SLNB, first interview)

Notwithstanding, the lack of accurate information was identified as a significant reason for the patients not take courage to exercise. After surgery, considering all the byproducts of operation, whether anticipated or unanticipated, patients' anxiety was not ungrounded. Accurate information regarding the types of activities and exercises that speed up the recovery from diverse postoperative symptoms was important.

*"Well, I can't find the information I need.. when should I work on muscles, when can I jog or run.. I don't know.."* (Participant #33, PM/SLNB, first interview)

Often, different health professionals such as surgeons, medical oncologists, physiatrists, and plastic surgeon (in case patients underwent breast reconstruction) provided varying information on when and how to exercise. Lack of information or inconsistent information was the barrier to exercise for breast cancer patients.

**Facilitators of Exercise**

*Accurate Information*. Accurate information on exercise according to the time after surgery was identified as the key facilitator to promote exercise among patients. The patients expressed their wish to have some professional consultation regarding exercise interventions that take their symptoms and health conditions into account.

*Encouragement and Support*. In the process of recovery after BCS, patients reported

social support as an important factor that motivated them to exercise more. Diverse sources worked, including medical professionals, exercise therapists, friends, family members, as well as fellow cancer patients.

> *"(Other patients in this rehab center says) You have to exercise. Otherwise, it'll become stiff. Those who have experienced something like myself informed me to do this and that, even regarding how to wash up. It's a great help from these folks who have been or are going through the similar experiences (treatment processes).. It's good."* (Participant #28, PM/ALND, third interview)

*First-hand Experience*. The participants reported their first-hand experience as an important motivator for exercise. They increased the activity level and exercised more after knowing the positive effects of exercise through experience.

> *"The more I exercise, the larger this angle becomes. It was really hard to follow the instructions when I wasn't working out. The more I tried, however, the easier it became. So I realized the importance (of exercise). If I do not exercise, it will be harder. So whenever it pops up in my mind, I try to do some exercise. Even in waking up, I tried to do some arm stretching."* (Participant #24, TS/SLNB, second interview)

*Sense of Purpose*. All the aforementioned factors contributed to the patients' sense of purpose, expecting the benefits of exercise. The expectation included pain reduction, fast recovery, relapse prevention, and health management. The patients who had mastectomy tried to motivate themselves to exercise more. In addition, they frequently expressed their wish to increase physical strength, muscle mass, and flexibility, as well as to maintain a healthy lifestyle.

> *"(People say) It takes 3 months to recover from the surgery, but recovery is up to me, I figure. Exercising and building muscles are up to me. So I do exercise."*

(Participants #2, TM/SLNB, third interview)

*"I think I got cancer because I had not exercised… There's no other reason. You know, there's no known cause for the triple negative breast cancer.. I guess it's from me not exercising… So I do exercise now, do walking at least."*

(Participant #9, PM /SLNB, second interview)

**Impact of Timing**

During the current study, the participants showed a certain pattern related to the time after BCS. Diverse factors contributed to the heightened psychological resistance, resulting in no or minimal exercise, in the early weeks after BCS. However, with the time and support of professional and social contacts, the patients expressed an increased sense of the purpose of exercise. Support from external sources, as well as own first-hand experience, produced this sense of purpose. The motivation along with proper instruction of tailored exercise intervention is projected to offset the psychological resistance in the early weeks after BCS (Figure 1). This pattern is consistent with the participants' actual amount of PA participation, which increased gradually from immediately after surgery to four weeks after surgery (Table 4).

**DISCUSSION**

**Summary of Results**

We employed an in-depth interview technique among breast cancer survivors within one month after BCS and identified the key barriers and facilitators of exercise. Physical constraints that were prominent in the early weeks, as reported in the literature,[23, 24] along with the pre-existing perception and attitude toward exercise developed psychological resistance to exercise among the patients. However, an increase in motivation to exercise was observed among patients in later weeks due to more encouragement from others, as was reported in other studies,[25-27] and higher sense of purpose from their own experience.

This process of increasing the sense of purpose, replacing the psychological resistance,

seemed to be propelled by professional intervention conducted at the right time with the correct exercise. All participants agreed that more accurate information and education were required to promote exercise. Multiple physical, psychological, and environmental circumstances served as conditions for psychological resistance among patients. The resistance grounded on the anxiety and fear of unintended injuries and unanticipated side-effects as a cancer survivor can only be overcome through professional diagnosis and exercise prescription. The complementary PA data revealed that patients' sense of purpose was positively associated with their actual amount of PA participation, reinforcing the requirement for professional intervention at the right time.

**Study Limitations and Strengths**

This qualitative study included only 33 participants. Hence, generalization of the results to all breast cancer survivors should be made with caution. Considering that the recruiting site was one of the major tertiary hospitals in Korea, the lived experiences of people living in rural areas or those treated in smaller hospitals, for instance, could not be captured in the current study. Therefore, to advance our understanding regarding the professional intervention that was identified as the key factor to promote exercise among the participants, a randomized control study should be performed. The long-term and short-term physical as well as psychological benefits of exercise can be examined more comprehensibly by investigating the effects of exercise intervention, preferably in a longitudinal study.

The strengths of the current study included repeated interviews over four weeks after surgery which enabled us to observe the change in patients' attitude toward exercise over time. Especially, in the current study, breast cancer patients were interviewed from only one week after surgery before implementation of exercise or rehabilitation intervention; however, recent studies have reported the importance of early exercise intervention after surgery in cancer patients.

## Clinical Implications

To mitigate the constant feedback loop between physical and psychological excuses, a tailored exercise intervention, considering patients physical and psychological conditions, should be designed. Considering the diverse anxiety expressed in the current study, tailored programs should consider each patient's physical and psychological needs to optimize the potential effects of the program.

Many breast cancer patients do not participate in PA and experience significant muscle mass loss during the first few months after surgery, which is associated with increased risk of type 2 diabetes and worse prognosis, including increased risk of recurrence.[28, 29] The findings of the current study revealed that breast cancer patients can benefit from early participation of exercise and PA, which may prevent loss of shoulder ROM and strength after BCS. Therefore, the importance of exercise needs to be emphasized and educated, not only among the patients but also among the health care professionals so that their recommendations to the patients can have real impact in changing motivation as well as behavior. In addition, the current study provides information regarding the attitude of breast cancer patients toward exercise during the early recovery stage after surgery and thus, promotes the development of appropriate intervention strategies.

## Conclusions

Thirty-three breast cancer survivors shared their experience and thoughts regarding exercise after BCS. Commonly expressed needs of the participants were summed as a professional intervention that takes into account the time after surgery and each individual's physical condition. Exercise was not only a matter of motivation and will power, but also a matter of resources that can be used with physical and psychological comfort.

## Contributorship statement

SJY and JYJ participated in study design. SJY, JHM, JYK, SIK and JYJ participated in data collection. SJY, ASJ, JHM, JYB, JYK, SHP, SIK and JYJ participated in data analysis and interpretation. ASJ, SJY, CWL, YJY, JMH and JYJ participated in the manuscript writing. All authors participated in the manuscript review and revision. All authors thank participants of the study and research coordinators at the Yonsei Cancer Center.

## Competing interests

None declared.

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## Data sharing statement

Data are available upon reasonable request. Interview transcripts will be available upon request on the specific area of interest.

Figure 1. Relations among categories according to time, which changes the weight of the barriers and facilitators of exercise

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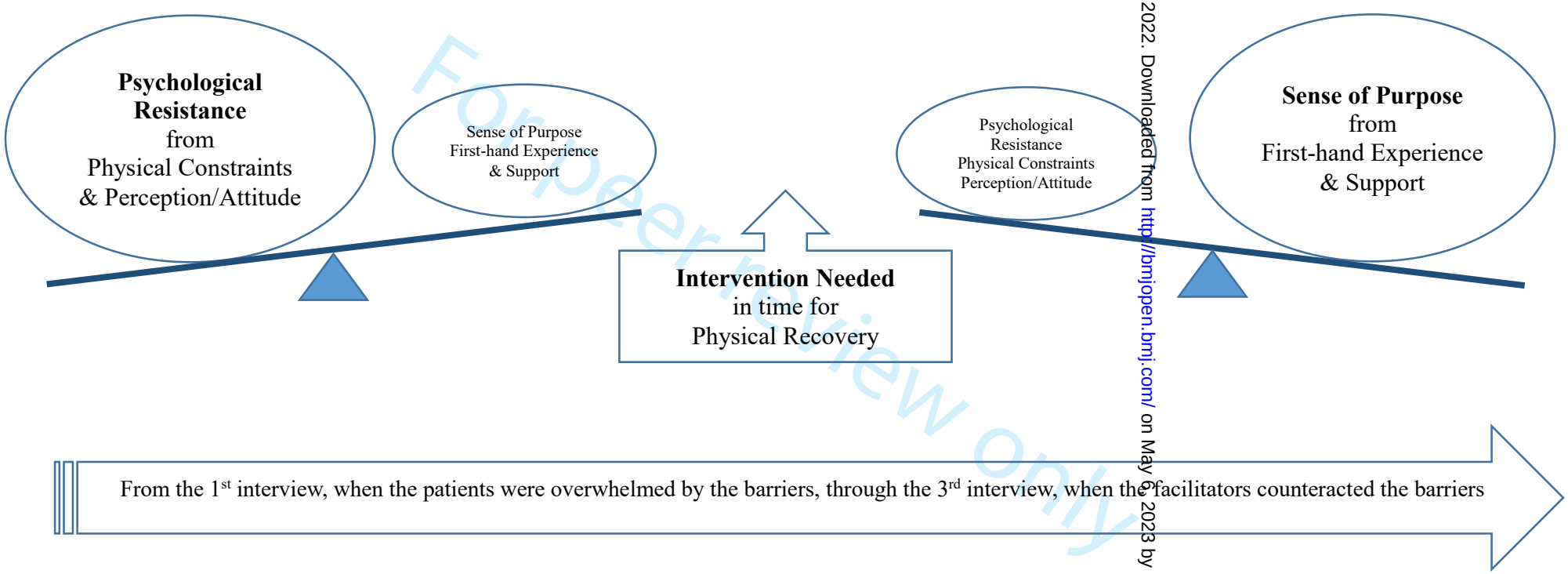
Figure 1. Relations among categories according to time, which changes the weight of the barriers and facilitators of exercise



# COREQ (COnsolidated criteria for REporting Qualitative research) Checklist

A checklist of items that should be included in reports of qualitative research. You must report the page number in your manuscript where you consider each of the items listed in this checklist. If you have not included this information, either revise your manuscript accordingly before submitting or note N/A

| Topic | Item No. | Guide Questions/Description | Reported on Page No. |
|---|---|---|---|
| **Domain 1: Research team and reflexivity** | | | |
| *Personal characteristics* | | | |
| Interviewer/facilitator | 1 | Which author/s conducted the interview or focus group? | 7 |
| Credentials | 2 | What were the researcher's credentials? e.g. PhD, MD | 1 |
| Occupation | 3 | What was their occupation at the time of the study? | 7 |
| Gender | 4 | Was the researcher male or female? | - |
| Experience and training | 5 | What experience or training did the researcher have? | 7 |
| *Relationship with participants* | | | |
| Relationship established | 6 | Was a relationship established prior to study commencement? | 5 |
| Participant knowledge of the interviewer | 7 | What did the participants know about the researcher? e.g. personal goals, reasons for doing the research | -- |
| Interviewer characteristics | 8 | What characteristics were reported about the inter viewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic | 7 |
| **Domain 2: Study design** | | | |
| *Theoretical framework* | | | |
| Methodological orientation and Theory | 9 | What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis | 8 |
| *Participant selection* | | | |
| Sampling | 10 | How were participants selected? e.g. purposive, convenience, consecutive, snowball | 5 |
| Method of approach | 11 | How were participants approached? e.g. face-to-face, telephone, mail, email | 5 |
| Sample size | 12 | How many participants were in the study? | 5 |
| Non-participation | 13 | How many people refused to participate or dropped out? Reasons? | 5 |
| *Setting* | | | |
| Setting of data collection | 14 | Where was the data collected? e.g. home, clinic, workplace | 6 |
| Presence of non-participants | 15 | Was anyone else present besides the participants and researchers? | 6 |
| Description of sample | 16 | What are the important characteristics of the sample? e.g. demographic data, date | Table2 |

| Topic | Item No. | Guide Questions/Description | Reported on Page No. |
|---|---|---|---|
| *Data collection* | | | |
| Interview guide | 17 | Were questions, prompts, guides provided by the authors? Was it pilot tested? | Table1 |
| Repeat interviews | 18 | Were repeat interviews carried out? If yes, how many? | 6 |
| Audio/visual recording | 19 | Did the research use audio or visual recording to collect the data? | 6 |
| Field notes | 20 | Were field notes made during and/or after the interview or focus group? | 6 |
| Duration | 21 | What was the duration of the interviews or focus group? | 6 |
| Data saturation | 22 | Was data saturation discussed? | 5 |
| Transcripts returned | 23 | Were transcripts returned to participants for comment and/or correction? | 7-8 |
| **Domain 3: analysis and findings** | | | |
| *Data analysis* | | | |
| Number of data coders | 24 | How many data coders coded the data? | 8 |
| Description of the coding tree | 25 | Did authors provide a description of the coding tree? | Table 3 |
| Derivation of themes | 26 | Were themes identified in advance or derived from the data? | 8 |
| Software | 27 | What software, if applicable, was used to manage the data? | N/A |
| Participant checking | 28 | Did participants provide feedback on the findings? | 7-8 |
| *Reporting* | | | |
| Quotations presented | 29 | Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number | 12-15 |
| Data and findings consistent | 30 | Was there consistency between the data presented and the findings? | 8-15 |
| Clarity of major themes | 31 | Were major themes clearly presented in the findings? | 8-15 Table 3 |
| Clarity of minor themes | 32 | Is there a description of diverse cases or discussion of minor themes? | 15-16 Table 3 |

Developed from: Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32 item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. 2007. Volume 19, Number 6: pp. 349–35