Health literacy and functional exercise adherence in postoperative breast cancer patients

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Purpose: To improve the quality of life of patients who received modified radical mastectomy, we investigated the factors affecting health literacy (HL) and exercise adherence in postoperative breast cancer patients and analyzed the relationship between them.

Methods: With random sampling method, we selected patients who received modified radical mastectomy in Nanjing First Hospital as research subjects. Then, questionnaires were given to 286 breast cancer patients who met the inclusion criteria (from January 2014 to June 2016). The questionnaire includes three parts: General Information, the Health Literacy Scale, and the Postoperative Functional Exercise Compliance Scale for Breast Cancer Patients. In this study, the count data were presented as frequency and constituent ratio and the measurement data were presented as mean ± standard error. Correlation and logistic analysis were both performed by using SPSS for Windows v.19.0.

Results: This study showed that the total mean score of postoperative functional exercise compliance of breast cancer patients was 82.65±12.38 points, and the total mean score of postoperative functional exercise compliance of breast cancer patients was 46.16±3.88 points. In addition, HL had a strong association with functional exercise compliance in each dimension except for economic support and proactively seeking advice compliance.

Conclusion: HL and functional exercise compliance of breast cancer after radical mastectomy in Nanjing First Hospital were both at a moderate level and need further improvement. HL could predict the functional exercise compliance of patients.

Keywords: postoperative, modified radical mastectomy, patient, health literacy, exercise adherence

Introduction
Breast cancer, with approximately 1.7 million women diagnosed and treated worldwide annually, imposes a burden both to families and society.1,2 Surgery has always played a central role in the management of breast cancer, and radical mastectomy is now becoming the first choice in vast majority of patients.3 However, breast cancer patients have to face a series of postoperative complications, including arm pain, edema, dysfunction, and other issues, which has a significant negative impact on their quality of life.4

Studies have reported that early postoperative functional exercise is safe and beneficial for breast cancer survivors and helps to reduce the ipsilateral upper extremity flap adhesions, limb edema, joint stiffness, and muscle atrophy and also improves the function of limb.5 However, long-term adherence to exercise programs is not easy to accomplish.

In 1974, Simonds, the American scholar, put forward the concept of health literacy (HL) in the international conference for the first time.6 Then, the World Health...
Organization defined HL as the individual’s cognitive and social skills, determining the individual’s understanding and use of motivation and ability to maintain and promote health information.2

Numerous reports have showed that HL could affect cancer patients’ understanding of therapeutic goals and treatment compliance. Husson et al3 explored the relationship between HL and health-related quality of life and found that low subjective functional HL among colorectal cancer survivors was associated with lower levels of physical activity and poorer health-related quality of life. Rust et al9 studied the relationship between initial HL and medication adherence, as well as initial HL and self-efficacy, and the results indicated that individuals with higher HL were more likely to have higher levels of self-efficacy and were more likely to adhere to medication instructions. Jin et al10 conducted a cross-sectional survey to examine the functional HL among older adults and identify influencing factors that can predict medication adherence. A total of 160 participants aged ≥65 years were enrolled. The results showed that medication adherence of elderly patients was linked to education level, health-related problems, dosing frequency, satisfaction with patient counseling, and explanation of medication, but it was not associated with functional HL. As a result, pharmacists should take elderly patients’ individual characteristics such as educational background and specific patient-related health problems into consideration so as to provide sufficient information and explanation of medication and ensure patient satisfaction with the counseling.

In China, survey of cancer patients with HL research is rare and remains to be explored. As a result, this research investigated the factors affecting the health literacy and exercise adherence in postoperative breast cancer patients and analyzed the relationship between them.

**Research patients and methods**

**Study design and participants**

Three hundred ten patients who received modified radical mastectomy in Nanjing First Hospital from January 2014 to June 2016 were selected in this survey. Data were collected from 295 patients on-site, and the recovery rate was 95.2%. Removing the incomplete questionnaires and those with logical errors, a total of 286 valid questionnaires were collected finally and included in this study.

The inclusion criteria were as follows:

1. Each breast cancer patient having received modified radical mastectomy
2. Patients knowing the diagnosis of the disease
3. Patients having the ability to read and write and fill in the questionnaire independently

The exclusion criteria were as follows:

1. Pathology diagnosis being made outside Nanjing First Hospital
2. Patients with unsuccessful investigation

Written informed consent was obtained from all patients prior to participation in the study. The medical ethics committee of Nanjing First Hospital, Nanjing Medical University, approved the study.

**Research methods**

The survey data were collected by using a questionnaire that consisted of three parts: the General Information, the Health Literacy Management Scale, and the Postoperative Functional Exercise Compliance Scale for Breast Cancer Patients. Figure 1 shows the flowchart of the research methods.

**General Information questionnaire**

The questionnaire investigated the general information of patients who underwent modified radical mastectomy for breast cancer, and these data included gender, age, marital status, occupational, education, types of Medicare, place of residence, and monthly allowance.

**Health Literacy Management Scale**

The scale consisted of 24 items with a total of 120 points, all of which were scored using five-point scale (5= no difficulty, 4= little difficulty, 3= some difficulties; 2= particularly difficult; 1= almost impossible to accomplish). The higher the score got, the higher the level of HL was. The scale is divided into four dimensions: information acquisition ability (9 items), communication and interaction ability (9 items), willingness to improve health (4 items), and economic support will (2 items).

**Postoperative Functional Exercise Compliance Scale for Breast Cancer Patients**

This scale consists of 18 entries with scores ranging from 18 to 72 (4= have no any difficulty to accomplish; 3= almost accomplish, 2= occasionally accomplish, 1= simply not able to accomplish). The scale was divided into three dimensions: physical exercise compliance (9 items), postoperative attention compliance (5 items), and active seeking for compliance (4 items).

**Statistical method**

The count data were presented as frequency and constituent ratio, and the measurement data were presented as
mean ± standard error. Correlation and logistic analysis were performed both by using SPSS for Windows v.19.0 (SPSS, Chicago, IL, USA). For all statistical tests, \( P<0.05 \) was defined as statistically significant.

**Quality control**

**Quality control of patients**
The purpose of the study and each part of the questionnaire were explained to the patients before filling of the questionnaire. Each questionnaire was completed alone by the patients, and then the investigators checked them and asked the patients to take time to fill the blank.

**Quality control of the questionnaire**
Before the data entry, the collected questionnaires were sorted out and selected, and the unqualified questionnaires were removed.

**Quality control of data entry**
The completeness of all questionnaires was checked before data entry by using the double-entry method. Significant deletions of data as well as logistic errors were corrected by searching the original questionnaire.

**Results**
A total of 310 questionnaires were sent out during the survey, 295 were collected on-site, and so the recovery rate was 95.2%. Removing the incomplete questionnaires and those with logical error, a total of 286 valid questionnaires were collected finally, making the effective recovery rate 92.3%.

**The general information of postoperative breast cancer patients**
The frequency and ratio was used to describe the sociological data of patients. Gender, age, marital status, occupation, education, types of Medicare, place of residence, and monthly allowance were investigated and are presented in Table 1.

**The status of HL of breast cancer patients after radical mastectomy**
The total scores of HL and the scores of each dimension of patients after radical mastectomy are shown in Table 2. The mean scores for each group were 32.28, 28.43, 14.94, and 7.00, respectively, and the total mean score of HL of breast cancer patients was 82.65±12.38.
Table 1 General information of postoperative breast cancer patients

| Variables              | N  | %   |
|------------------------|----|-----|
| Gender                 |    |     |
| Male                   | 2  | 0.7 |
| Female                 | 284| 99.3|
| Age (years)            |    |     |
| < 35                   | 67 | 23.4|
| 35–60                  | 173| 60.5|
| > 60                   | 46 | 16.1|
| Marital status         |    |     |
| Single or never married| 23 | 8.0 |
| Married or cohabitating with someone | 176 | 61.5 |
| Widowed                | 35 | 12.2|
| Divorced or separated  | 52 | 18.3|
| Occupational workers   |    |     |
| Workers                | 54 | 18.9|
| Farmers                | 67 | 23.4|
| Personnel of enterprises and institutions | 56 | 19.6 |
| Civil servants or managers | 27 | 9.4 |
| Self-employed          | 31 | 10.8|
| Freelancers            | 25 | 8.8 |
| Other                  | 26 | 9.1 |
| Education              |    |     |
| Elementary school or less | 33 | 11.5 |
| Middle school          | 81 | 28.3|
| High school            | 105| 36.7|
| College level or more  | 67 | 23.5|
| Place of residence     |    |     |
| Countryside            | 132| 46.2|
| Town                   | 84 | 29.4|
| City                   | 70 | 24.4|
| Monthly allowance (yuan) |    |     |
| < 1,000                | 58 | 20.3|
| 1,000–2,999            | 88 | 30.8|
| 3,000–4,999            | 105| 36.7|
| 5,000–9,999            | 29 | 10.1|
| 10,000+                | 6  | 2.1 |
| Types of Medicare      |    |     |
| Insurance for urban employees | 69 | 24.1 |
| Insurance for urban residents | 58 | 20.3 |
| Rural health insurance | 137| 47.9|
| Other health insurance | 12 | 4.2 |
| No health insurance    | 10 | 3.5 |

Table 2 The scores of HL of breast cancer patients after radical mastectomy

| Dimension type                     | Score range | Total score mean (mean ± SE) |
|------------------------------------|-------------|-----------------------------|
| Information acquisition ability    | 0–45        | 32.28±8.04                  |
| Ability to communicate and interact| 0–45        | 28.4±6.67                   |
| Willingness to improve health      | 0–20        | 14.9±1.77                   |
| Economic support will              | 0–10        | 7.0±1.63                    |
| Total health literacy score        | 0–120       | 82.6±12.38                  |

Abbreviations: HL, health literacy; SE, standard error.

Current status of functional exercise compliance after modified radical mastectomy for breast cancer patients

The total scores of functional exercise compliance and the scores of each dimension in patients with modified radical mastectomy are shown in Table 3. The mean scores for each group were 18.94, 17.73, and 9.49, respectively, and the total mean score of postoperative functional exercise compliance of breast cancer patients was 46.16±3.88.

The correlative analysis of patients’ HL and functional exercise compliance

Our result showed that HL had a strong association with functional exercise compliance in each dimension except for economic support will and proactively seeking advice compliance (Table 4). The logistic regression analysis among the total score of postoperative functional exercise compliance of breast cancer patients and factors influencing HL revealed that HL could predict the functional exercise compliance of patients (Table 5).

Discussion

HL of breast cancer patients after radical mastectomy

Information acquisition ability refers to recognizing the health needs and searching for information independently. In this study, the patient’s information acquisition ability score was 32.28±8.0 points lower than the 41.3±5.9 points in patients with chronic diseases. This may be due by the fact that cancer patients often have multiple complex treatment options and so patients with low levels of HL have limited knowledge of their disease and find it difficult to make informed medical decision.

Communication is the ability of the patient to communicate with others in order to obtain social support to help them. In this study, patients with modified radical mastectomy for breast cancer got 29.06±7.29 points on average, which was...
not satisfactory. Von Wagner C reported the association between performance on HL measures and health outcomes and found that low HL could affect interactions between patient and medical staff, thereby leading to poor health outcomes.13

The willingness to improve health is the degree to which patients voluntarily take the time and effort to improve their health. In this study, the score of patient’s willingness to improve health was 14.94 ± 1.76 points, indicating that patients’ willingness to improve health was strong. Oncologists have also found that patients with high HL are more likely to actively seek out relevant health information.14

Economic support will include the patient’s willingness to invest in health issues and the ability to pay for medicare by themselves. In this study, the patient’s willingness to support their own financial needs was 7.00±1.63 points, which was slightly lower. On the one hand, the majority of patients in this survey were from rural areas, and so their economic capacity was limited, and also the rural health insurance has a low proportion of reimbursement. On the other hand, follow-up treatment for breast cancer patients after radical mastectomy is costlier, and so patients had to bear great economic pressure.

HL represents the individual’s cognitive skills, social skills, and ability to maintain and promote health information. The results of this study showed that the total mean score of postoperative functional exercise compliance of patients with modified radical mastectomy for breast cancer was 82.65±12.36 points lower (97.2±12.9 points) than that of the patients with chronic diseases (P<0.05).11

### The compliance of functional exercise after modified radical mastectomy in breast cancer patients

This study showed that the overall functional exercise compliance was 46.16±3.87 points in patients with breast cancer after radical mastectomy exercise compliance, which needed to be further improved. The compliance of breast cancer patients with overall functional exercise was poor, especially physical exercise compliance. This outcome may result from the fact that patients were busy with work and life, giving up physical exercise. In fact, as long as patients pay a little attention to affect the recovery of limb behavior in daily life, they can complete the physical exercise. With the facilitation of communication, patients can interact with the medical staff through Tencent instant chat tool, Web Chat, and other forms of Internet. As a result, the initiative by patients to seek advice regarding compliance was high.

### Correlation between patient’s HL and functional exercise compliance

HL of patients has a direct predictive effect on their therapeutic compliance. Kim et al.15 critically appraised empirical evidence investigating pathways between HL and cervical

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**Table 4** The correlative analysis of patients’ HL and functional exercise compliance

| Dimension type                        | Information acquisition ability | Ability to communicate and interact | Improvement of health will | Economic support will | Total health literacy score |
|---------------------------------------|---------------------------------|-------------------------------------|---------------------------|----------------------|----------------------------|
| Physical exercise compliance          | 0.430* (0.000)                  | 0.148** (0.012)                    | 0.175* (0.000)            | 0.555* (0.000)       | 0.433* (0.000)             |
| Postoperative attention compliance    | 0.118** (0.047)                 | 0.144** (0.015)                    | 0.206* (0.000)            | 0.245* (0.000)       | 0.192* (0.000)             |
| Proactively seek advice compliance    | 0.452* (0.000)                  | 0.454* (0.000)                     | 0.402* (0.000)            | 0.092 (0.119)        | 0.534* (0.000)             |
| Total score of postoperative functional exercise compliance | 0.486* (0.000)                  | 0.328* (0.000)                     | 0.355* (0.000)            | 0.492* (0.000)       | 0.555* (0.000)             |

**Notes:** Values within the parentheses represent the P-value. *P<0.01; **P<0.05.

**Abbreviation:** HL, health literacy.

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**Table 5** Logistic regression analysis of the total score of postoperative functional exercise compliance of breast cancer patients and factors influencing HL

| Dimension type                        | B   | t    | Sig    | EXP(B) 95% CI       |
|---------------------------------------|-----|------|--------|---------------------|
|                                       |     |      |        | Lower limit | Upper limit          |
| Information acquisition ability       | 0.122 | 3.842 | 0.000* | 0.060           | 0.185                 |
| Ability to communicate and interact  | 0.097 | 1.922 | 0.000* | 0.000           | 0.196                 |
| Willingness to improve health         | 0.858 | 7.694 | 0.056  | 0.638           | 1.077                 |
| Economic support will                 | 0.894 | 6.483 | 0.000* | 0.623           | 1.166                 |

**Note:** *P<0.05.

**Abbreviations:** CI, confidence interval; HL, health literacy; Sig, significance; EXP, exponential.
cancer screening and reported that evidence supported a positive link between HL and cervical cancer screening. Komenaka et al16 investigated the relationship of HL and screening mammography. A total of 1,664 consecutive patients aged ≥40 years were seen. Only 516 (31%) patients had undergone screening mammography. Logistic regression analysis that included ethnicity, language, education, smoking status, insurance status, employment, income, and family history found that only three factors were associated with not obtaining a mammogram: low HL, smoking, and being uninsured. In the present study, it was found that the HL of patients could positively predict their functional exercise compliance. Our result showed that HL had a strong association with functional exercise compliance in each dimension except for economic support will and proactively seeking advice compliance (Table 3). Patients with high levels of HL have a better understanding of the function of the medical staff and a strong desire to speed up their rehabilitation.

Limitations
Due to the limitation of objective conditions and research time, this study adopted the convenience sampling method, and only one hospital participated, which may affect the sample representation. Therefore, future studies should increase the representative of the sample and further expand the sample size.

Conclusion
HL and functional exercise compliance of breast cancer after radical mastectomy in our hospital were both at a moderate level and needed further improvement. HL could predict the functional exercise compliance of patients.

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Disclosure
The authors report no conflicts of interest in this work.

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