What causes patients with breast cancer to change employment?: evidence from the health insurance data in a medical facility

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Abstract : This study aims to make clear the following aspects of breast cancer patients and their occupation. 1. What percentage of patients have changed their working status around surgery? 2. When did patients change their employment? 3. What is the cause of the employment change? We investigated 269 patients who underwent curative surgery for primary breast cancer at one university hospital in Tokyo. Patients who were under the age of 58 at the time of surgery and had the experience of being a company or government employee during a year prior to the surgery were used as sample for analysis. To determine factors related to the employment change, multiple logistic regression analysis was performed. Nineteen percent patients changed the employment status before and after surgery. Of those, 19% changed the employment by the end of surgery month while 42% did by the fourth month after surgery. Treatment-related factors such as mastectomy and the combination of chemotherapy and hormone therapy affected changes in employment. We believe that the validity of our study can be confirmed by comparing with the previous study results. We show the potential large effects of cancer treatment on patients' daily lives.

Key words : Breast cancer, Cancer patients, Employment, Health insurance, Treatment

Introduction

Cancer incidence rate in Japan has been showing an increasing trend. Although it is said that cancer is a disease associated with aging, one in every three cancer patients contract the disease while they are still in the working age[1]. Due to an advancement in medical care related to cancer, ambulatory treatment has become an available option for more patients who receive such treatments as chemotherapy and radiotherapy. In the meantime, around 30% patients who hope to keep the employment are reported to leave their work after cancer diagnosis[2].

It has been pointed out that one or more of the following factors such as (1) personal factors, (2) disease- and treatment-related factors, and (3) work-related factors affect the patient's decision on whether taking sickness absence, leaving work or otherwise. In terms of personal factors, patients with higher age, lower education, whose sex is female and with physical symptoms are more likely to take leave from work either temporarily or permanently[3–5]. Treatment modalities such as the presence of

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invasive surgery and chemotherapy, which are included in disease- and treatment-related factors, also has the similar effects[3, 6]. Those who have hard work, who perceives she lacks employer accommodation, and those without flexible working arrangements and advice from doctors about work tend to leave work compared with those who do not[5, 7].

Accurate and objective measurement of the state of disease and work is needed to understand and examine how the disease influences employment. The fact that medical facilities manage the data on both treatment provided and patients' insurance coverage makes the data base particularly useful for our study.

The universal healthcare insurance system has been established in Japan since 1961, which requires each individual to enroll in one of the medical insurance. Public Medical Insurance system is classified into categories such as Employee's Health Insurance (EHI) that insures the business employees, National Health Insurance (NHI) that mainly insures farmers, self-employed workers, pensioners, non-regular employees and non-employees, and Advanced Elderly Medical Service System that chiefly insures people of 75 yr old or more. EHI is further divided into Health Insurance (HI) for general employees, insurance for sailors, and various Mutual Aid Associations (MAA) for government officials, local officials and private school personnel. Furthermore, HI mentioned above is subdivided into Japanese Health Insurance Association (Association-Kenpo; AK) composed of medium- and small-sized companies, and Association-managed Health Insurance (Health Insurance Associations; HIA) administered by large companies. Therefore, it is possible to draw an inference from these insurance data on the size of the company an insured patient works for, and whether and when a patient underwent an employment change.

The five-year work continuance rate for all cancer patients who were employed in large companies and later returned to work (RTW) is reported 48.5% in the previous study[8]. This ratio is considered to be raised by the corporate employment support system such as flexible part-time employment, workplace accommodation, and occupational physician interviews. Meanwhile, because smaller-sized companies are more likely to have difficulties to establish the solid employment support system for workers with cancer or other diseases, this ratio could be lower for those companies. However, the effect of company size on work continuance rate has not been well-known.

Breast cancer is the most common cancer among Japanese females[1], and the prevalence rate has been increasing. The incidence of breast cancer in women begins to increase from the age of 30, peaks in the latter half of the 40s, remains almost constant, then decreases gradually from the late 60s[1]. The age of Japanese patients tends to be lower than that of Western countries[9].

The initial treatment of breast cancer is the multimodal therapy which combines surgery, radiation therapy and drug therapy, and among them, surgery and drug therapy are the two principal therapies. In the case of surgery, either mastectomy or breast-conserving surgery (BCS) is chosen according to the condition of cancer and a patient's request. If BCS is implemented, radiation therapy is also added after surgery. Drug therapy includes chemotherapy, hormone therapy (endocrine therapy), and molecularly targeted therapy. The kind of drug and its administration method are selected based upon the type and condition of cancer. Drug therapy may be performed before surgery depending on the condition of cancer.

According to Islam *et al.*, research on related factors of work continuation in breast cancer patients has been conducted mainly in Europe and North America, however, few previous studies have been conducted in Asia[10].

This study aims to explore the following points for patients with different working backgrounds using insurance data of a medical facility:

1. What percentage of patients have changed their working status around surgery?
2. When do patients change their employment?
3. What is the cause of the employment change?

We consider a patient's insurance status to be the proxy for her employment status, and thus, regard that the patient changes her job when she changes her insurance status.

We will also discuss the important points in utilizing the insurance data stored in medical facilities as proxy for the employment status.

Subjects and Methods

Samples (Fig. 1)

One thousand twenty three female patients who underwent curative surgery at one university hospital in Tokyo between January 2012 and August 2014 are included as the potential sample, among which the study sample is extracted.

Only samples under the age of 58 yr old or younger when the surgery took place were utilized for the analyses. It is because the typical retirement age in Japan is 60 yr old, and those who reaches the retirement age during the study period will retire regardless the presence of the disease.
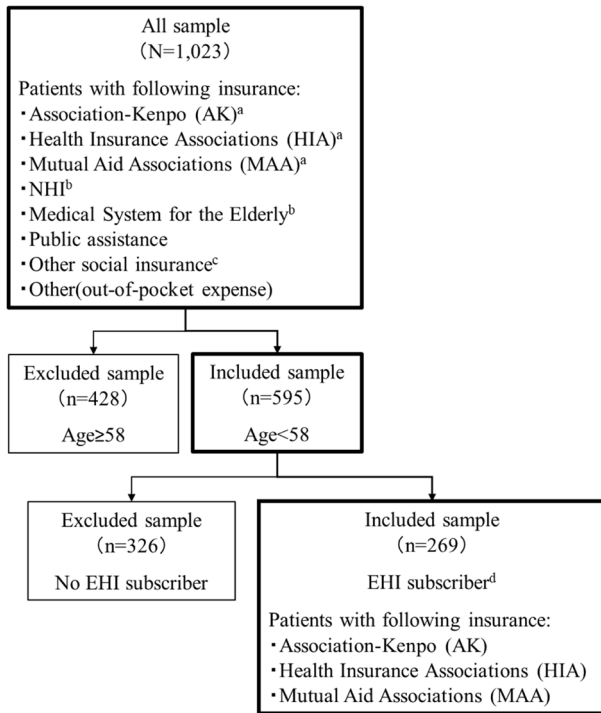
Fig. 1. Sampling procedure.
EHI: Employee's Health Insurance; NHI: National Health Insurance.
[a] total of subscribers and dependents.
[b] subscribers.
[c] daily employment, self-defense official.
[d] subscribers of EHI before and after surgery below 58 yr.

In addition to this condition, samples are further restricted to those who happened to have the time period of being an EHI subscriber herself, that is, she was a company or government employee herself, during the one year period before the surgery. Those who are self-employed or unemployed are excluded from the estimation. Self-employed are excluded because they have NHI, which is not linked to the workplace and therefore indistinguishable from the insurance data whether and when she changed her job.

The number of extracted sample for the purpose of our study based on the procedure mentioned above is 269.

Data

Extracted data from the database at the hospital includes the year and the month of surgery, patient's age at the time of surgery, treatment including the type of surgery and therapy, the kind of insurance, and whether she herself is a subscriber or a dependent member of the insurance.

Data was collected on whether and when the chemotherapy, hormone therapy and molecularly targeted therapy was applied within the time period from one year prior to surgery to two years after surgery.

Because more than one drug is often combined in drug therapy, patients were classified into four groups based on whether they received hormone therapy and/or chemotherapy in order to examine accurate effects.

The data on patient's insurance is the monthly data for the same period. It should be noted that the change of patient's insurance can be recognized by the hospital only when the patient visits the facility with the new insurance for the first time following the change. We presume that the previous insurance, thus employment, continues until the month before her first visit with the new insurance.

The reason we set our observation period to one year prior to surgery is that we also wanted to study the impact of cancer diagnosis and primary systemic therapy (PST), which generally starts during this period prior to the surgery. Likewise, we restrict our observation to two years after the surgery because initial treatments for breast cancer such as radiation therapy and chemotherapy are completed and the physical side effects such as vomiting and nausea in most cases subside during this period. Another reason for taking this study period is economical. The maximum payment period of invalidity benefit which compensates the income loss while the patient is still in employment and takes the temporary sick leave is one and a half years. The fact that a worker in the temporary sick leave is not legally paid after this period may have an impact on whether she maintains her work. We seek to include this financial aspects of patients in our analysis.

The method of analysis

The Kruskal-Wallis test was conducted to test the relationship between insurance type and insurance change.

If a person who was an EHI subscriber before surgery changes her insurance into either becoming a subscriber of another EHI, a dependent member of her family member's EHI, or a member of NHI, we regard that she changes her employment. We depict the histogram for the first employment change in order to examine when these changes happen.

Multiple logistic regression analysis was employed in our main analysis to investigate the discrete dependent variable and the factors affecting employment change while controlling the influence of variables other than the one we focus on. Univariate analysis was performed to choose explanatory variables in multiple logistic regression (Appendix 1).

The study was approved by the ethics committee of Juntendo University Hospital.

Results

Sample characteristics (Table 1)

Average age for this sample is 45.9 yr old (SD ± 6.2, range 27–57), and those in her 40s has the highest percentage of 57%. Of these sample, 52% have received mastectomy whereas 48% have BCS (Appendix 2). 34% patients have received multiple drug therapy which is both chemotherapy and hormone therapy. Patients with a single drug therapy breaks down into those with only hormone therapy and only chemotherapy. Those numbers are 43% and 7%. Patients with neither of those therapies take up 16%. Concerning the insurance type, HIA has the highest rate of 63%. AK comes next at 26%, and MAA third at 11%.

Employment change and re-employment (Tables 2, 3)

Nineteen percent (52 out of 269) patients have changed her insurance at least once during the study period (number of change: once 69%, twice or more 31%). The percentage of people who changed insurance was 20% in AK, 21% in HIA and 10% in MAA. There appears to be the large difference in numbers with respect to each insurance group, however, no statistically significant difference was found, possibly due to the lack of sample size with MAA.

When we examine the first insurance change, 14% changed from AK subscriber to another EHI subscriber, 86% from AK to either a dependent EHI or NHI, 23% from HIA to another EHI, 77% from HIA to dependent EHI or NHI, and all MAA members into dependent EHI or NHI.

Nineteen percent (ten out of 52) people moved to another company and continued to work.

Among those who had left work, 24% (ten out of 42) returned to work and became an employee in another company. Therefore, a total of 39% (20 out of 52) people were re-employed after changing her original work.

The timing of employment change (Fig. 2)

The mean period from surgery to insurance change is 8.7 months (SD ± 8.1, range (−5) −24, median 9).

Among people who changed employment, five out of 52 (10%) had changed their employment before the end of the previous month of surgery (all five received PST) while cumulative ten people (19%) had changed if we count the cases including the month of surgery. The maximum number of people, which is seven or 14%, changed their jobs at the fourth month after surgery. Cumulative 22 people (42%) had changed employment by the fourth month following surgery. 34 people (65%) had changed by the end of the 12th month.

Table 1. Sample characteristics (N=269)

Characteristics	%
Age (yr)	
Mean ± SD (Range)	45.9 ± 6.2 (27–57)
<30	1
30–39	14
40–49	57
50–57	28
Type of surgery	
Mastectomy	52
Breast-conserving surgery (BCS)	48
Axillary lymph node dissection (ALND)	
No	68
Yes	32
Combination of type of surgery and ALND	
Mastectomy, ALND−	31
Mastectomy, ALND+	21
BCS, ALND−	37
BCS, ALND+	11
Type of drug therapy	
Chemotherapy (CT)	
No	59
Yes	41
Hormone therapy (HT)	
No	23
Yes	77
Molecularly targeted therapy	
No	86
Yes	14
Primary Systemic Therapy	
No	81
Yes	19
Combination of drug therapies	
CT−, HT−	16
CT−, HT+	43
CT+, HT−	7
CT+, HT+	34
Type of insurance	
Association-Kenpo (AK)	26
Health Insurance Associations (HIA)	63
Mutual Aid Associations (MAA)	11

Factors related to employment change (Table 4)

The type of surgery was found to have significant effect on employment change, and people with mastectomy are more likely to change jobs than those with BCS (OR 2.46, 95%CI 1.24–4.87). In addition, we also found patients with multiple drug therapies tend to change jobs more than those who are not the case (OR 1.83, 95%CI 0.96–3.49). On the other hand, no statistically significant relationship was found either between age and employment change, or

**Table 2. Type of insurance and insurance change (N=269)**

Insurance change	Type of insurance						p-value
	Association-Kenpo (AK) (n=71)		Health Insurance Associations (HIA) (n=168)		Mutual Aid Associations (MAA) (n=30)		
	n	%	n	%	n	%	
No n=217 (81%)	57	80	133	79	27	90	0.383
Yes n=52 (19%)	14	20	35	21	3	10	

Kruskal-Wallis test.

Table 3. Insurance before and after the first insurance change (N=52)

Insurance after change	Insurance before change					
	Association-Kenpo (AK) (n=14)		Health Insurance Associations (HIA) (n=35)		Mutual Aid Associations (MAA) (n=3)	
	n	%	n	%	n	%
Other EHI (subscriber) n=10 (19%)	2	14	8	23	0	0
EHI (dependent) • NHI n=42 (81%)	12	86	27	77	3	100

EHI: Employee's Health Insurance; NHI: National Health Insurance.
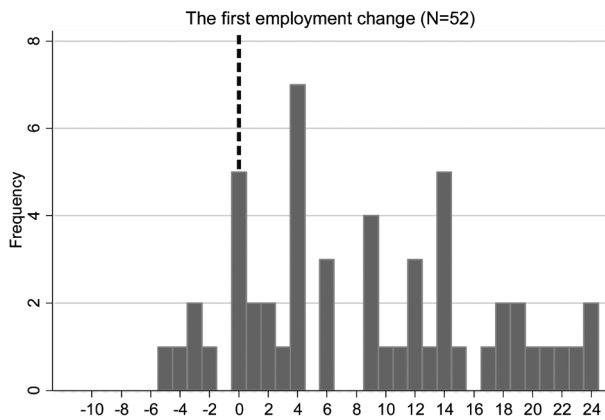
Fig. 2. The first employment change (months from the surgery).

Table 4. Factors influencing employment change in breast cancer patients (N=269) (Multivariate logistic regression)

Variables	OR	p	95%CI
Age	1.04	0.12	(0.99–1.10)
Mastectomy[a]	2.46	0.01	(1.24–4.87)
CT+, HT+[b]	1.83	0.07	(0.96–3.49)
Association-Kenpo (AK)[c]	0.78	0.50	(0.38–1.61)
Mutual Aid Association (MAA)[c]	0.35	0.11	(0.97–1.26)

OR: Odds Ratio; 95%CI: confidence intervals; CT: chemotherapy; HT: hormone therapy.
a reference: breast-conserving surgery (BCS).
b reference: (CT−, HT−)+(CT−, HT+)+(CT+, HT−).
c reference: Health Insurance Associations (HIA).

between insurance type and employment change.

Discussion

Sample characteristics

Our sample is biased toward employees of large companies. 62% of patients have the insurance related to large companies while 34% do in the general population with EHI according to the statistics[11–14]. Part of our analysis includes company size as one of the independent variables to control this deviation, but caution is needed to interpret other results.

Employment change and re-employment

We found that 19% of patients changed the insurance. This figure was somewhat lower than that of the previous studies in which 21.3%[15], 24.4%[16], 34.6%[2] of patients left employment. This may be due to several differences in the settings of the target population. First, we targeted at only breast cancer patients while other studies include cancer patients other than breast cancer. Breast cancer patients have been reported to have relatively higher RTW than others, and this might have affected our results[17, 18]. Second, we have covered only two-year period following surgery while other studies have covered for longer period. This might have caused the lower cumulative employment change rate. Third, only subscribers of her own EHI consist our sample. Self-employed, and part-time and irregu-

lar workers without their own EHI are not included. This fact might also have lowered our employment change rate. Therefore, when these factors are taken into consideration, we consider the average turnover ratio obtained with our sample is at the reasonable level. In general population including healthy people in Japan, the average turnover ratio is around 10% among age groups between 40 and 59[19]. This turnover ratio includes both personal such as injury and illness, and organizational reasons.

When we scrutinize the insurance change rate with respect to each type of insurance, AK and HIA have relatively higher rate than those with MAA despite that the relationship is statistically insignificant. This result is similar to Ito *et al.*, in which no statistical difference among various types of workers was confirmed[20].

Among those who have changed jobs once or more, most have changed into other family member's EHI or NHI for their first change after surgery. Those insurance do not require employment. The subsequent re-employment rate after giving up the original job was 39%. This result is lower than that of the earlier study of breast cancer survivors in Japan revealing re-employment rate is 61.3% after losing the job[21]. This difference may be due to the fact that the observation period of our subject is only two years after surgery, or that patients with non-regular jobs and without EHI are not included in our sample.

The timing of employment change

The previous questionnaire survey on people of a wide age-group with cancer in various sites of the body shows 29.7% have left work in less than three months of diagnosis, 54.1% within one year, and 77.4% within three years[2]. In another questionnaire targeting workers with various cancer, researchers found 40.2% quit the job between the time of diagnosis and initial treatment[15]. Both studies show similar results that around 30–40% have left the job shortly after the diagnosis.

In this study, we examined the period starting from surgery to employment change. Our findings are not totally comparable to other studies because we start counting time from the date of surgery while previous studies start from the date of diagnosis. Regardless of these differences, the results seem similar in the respect that the turnover ratio begins to increase even before the surgery and its rate peaks at the relatively early stage around the surgery.

Factors related to employment change

We found that treatment-related variable impacted turnover. For type of surgery, extensive surgery as mastectomy

and axillary lymph node dissection (ALND) have been reported to have a negative effect on work continuation compared to BCS[3, 22, 23]. Our finding was similar to these results. It is known that after breast cancer surgery, pain, numbness and difficulty in moving arm and shoulder and lymphedema by lymph node dissection occur among patients[24–26]. When long-term effects on the arm and shoulder after breast cancer surgery is compared between patients with radical modified mastectomy (RM) and those with BCS and radiation therapy after ALND, lymphedema of the arm, restriction of the flexion range of the shoulder, pain of shoulder, and arm/shoulder dysfunction were higher among those with RM[27]. Regarding the association with work, it has been reported that shoulder function impairment delays partial RTW[28]. Furthermore, it has been reported that compared to BCS, mastectomy has a negative effect on QOL after surgery[29], physical function and role function at one year after diagnosis and overall QOL and social function after five years[30]. The influence of surgery on patient's physical and mental health conditions may have affected employment status.

Turnover tended to increase in this study when chemotherapy and hormone therapy were combined. For example, one research examined the effects of multimodal treatment, that is, the combination of radiation therapy and chemotherapy, and found the combination increases turnover[28]. However, as far as we know, no research that studies the effects of chemotherapy and hormone therapy combination on employment has been conducted.

Previous study that examined the effects of chemotherapy alone found that chemotherapy has negative effect on RTW[23, 28, 31, 32, 34] and decreases working[33]. The observation period for these studies were ten to 24 months after diagnosis or surgery. However, other studies that examined the effect of chemotherapy on work continuation for a longer period of time found no significant relationship between them[22, 35]. In this study, we observed up to two years after surgery. We made several attempts to identify the effects of chemotherapy alone, however, found no significant effects. Our two-year study period is in the middle range of these studies, which makes our results compatible with these previous studies. The longer the period after surgery, the more patients return to work in terms of the effects of chemotherapy.

We also checked whether hormone therapy affects patients' decisions on employment, and found no significant relationship. In a study that examined the effects of hormone therapy alone, it has been reported that hormone therapy (Tamoxifen) increases the risk of sickness absence

as of three years after diagnosis[22]. Although hormone therapy is considered to have fewer side effects than chemotherapy, side effects such as hot flash, symptoms of joints, bones and muscles, anxiety and depression may occur[36]. In a study that examined long-term effects on breast cancer patients, it has been reported that hormone therapy may increase the risk of leaving or changing jobs due to its sequential symptoms[37]. The standard dose period of hormone drugs is five years, and this long-term treatment period even after the end of chemotherapy may affect the continuation of work.

Age was not found to be related to insurance change in our study. Some previous studies of breast cancer patients that examined the effect of age on the continuation of work report negative relationship[7, 35], while other studies found no such relationship[23]. These study results are mixed and the effect of age was not clearly known. In our present study the subject's age range was rather narrow, which may have influenced the results.

Even in analyses that controlled other variables, we found no relationship between insurance type and employment change. In general, large companies are thought to have better employment support systems for workers with disease compared to small- and medium-sized companies. However, individual cancer patient has various background and situation. Different patient may require different support system[38]. Therefore, more specific aspects of the welfare system rather than mere general aspects such as company size may be necessary to know the exact effects on turnover. Spelten *et al.* concludes that the supportive work environment promotes RTW, and that more systematic research to RTW is needed[39]. In another research, it is also shown that perceived employer accommodation for cancer illness and treatment is positively correlated to RTW[7]. Furthermore, Pryce *et al.* reported that flexible working arrangements and advice from doctor about work affect continued employment for cancer patients[5]. However, little is known about the details of the workplace accommodation or support in the workplace that are needed to encourage RTW. It is necessary to explore the current circumstances of workplace accommodation for cancer workers in more detail, in order to know the influence on work continuation.

Usefulness and limitations in using the insurance data

The point of caution when dealing with medical facility's insurance data as a proxy for the working condition is that we are not able to distinguish job changes that are unrelated to cancer from those related.

Moreover, when insurance data are used to represent patients' job status, job changes are not accurately recognized at the moment each change occurs. If a patient do not visit the hospital for several months, we could not help but assume that she did not change the working status during these period.

Furthermore, since we only have data on the type and subscriber of insurance, job changes within the same insurance category are not captured. It is the future theme to collect data on the changes from one HIA to another in order to conduct more accurate research.

Another potential issue is the exclusion of the irregular workers without their own EHI from our sample. It is reported that 56% of Japanese female employees are irregular workers[40].

Taking all these factors into consideration, some caution is necessary to interpret the results of studies based on the insurance data for representing employment status. In our study, however, we obtained similar results with previous studies, which we believe it shows the satisfactory level of reliability for using insurance data to represent the state of employment.

Implications for future studies

Regardless the limitations mentioned above, we made an attempt to use long-term objective insurance data which can be more accurate and reliable than subjective questionnaire data solely based on patients' memory. Besides this objectivity issue, we believe the variety our data deserves the attention. Our sample includes data from various companies which differs in size, support system and workplace accommodation. Questionnaire within a particular company or an insurer cannot examine those issues.

As far as we know, this is one of the few studies with breast cancer patients working in variety of companies to explore how often, when, and what kind of employment change occurs following cancer diagnosis, and what causes these changes.

However, there are several limitations in this research. Firstly, with the turnover ratio reported in this research, we cannot know the individual reason and intention for the employment change. Job changes in our data both include those who quit because of the disease and those who originally had planned to retire early even without the disease.

Secondly, even though we included some demographic characteristics such as age and sex, and medical characteristics such as treatment methods in order to analyze their effects on employment status, there are still many unac-

counted factors. For example, socioeconomic variables such as main livelihood, the construction of family members, the number of children and income are not included. Work-related factors such as nature of work, job title, motivation, philosophy and meaning of work, and satisfaction toward work can be all considered relevant with decisions on employment[41], but not included in this study. We believe the attempt to combine reliable objective data with flexible subjective data in one of the potential way to improve our study.

Thirdly, this study was conducted only with patients in one university hospital in the Tokyo metropolitan area. Female employment rate and thoughts toward work may vary regionally. These inter-regional variations are certainly one of the productive future research themes not covered in this study.

Conclusion

We investigated changes in employment and its related factors from one year before to two years after surgery of breast cancer patients who underwent curative surgery at a university hospital. We found following points:

1. Nineteen percent of patients changed their insurance. Thirty nine percent of those who changed the insurance were re-employed.

2. The timing of employment change counted from the date of surgery was examined. Of those who changed insurance, 19% of patients changed the job by the end of surgery month and 42% of patients by the end of the fourth month after surgery. The number of employment change increased in the period shortly after surgery, and reached its peak.

3. Treatment-related factors such as mastectomy, combination treatment of chemotherapy and hormone therapy affected employment change. Therefore, the importance of employment support for breast cancer patients is implicated.

Acknowledgements

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Appendix 1.

Factors influencing insurance change in breast cancer patients (N=269) (Univariate logistic regression)

Variables	OR	*p*	95%CI
Age (continuous variable)	1.02	0.39	(0.97–1.07)
Age (categorical variable)[a]			
<30, 30–39	0.54	0.24	(0.20–1.50)
50–57	1.04	0.91	(0.53–2.05)
Mastectomy[b]	2.44	0.01	(1.28–4.67)
Axillary lymph node dissection (ALND)	0.85	0.64	(0.44–1.65)
Combination of type of surgery and ALND[c]			
BCS, ALND+	0.77	0.70	(0.20–2.92)
Mastectomy, ALND−	2.68	0.01	(1.26–5.67)
Mastectomy, ALND+	1.83	0.17	(0.77–4.33)
Chemotherapy (CT)	2.08	0.02	(1.13–3.83)
Hormone therapy (HT)	1.32	0.47	(0.62–2.82)
Molecularly targeted therapy	1.97	0.09	(0.90–4.31)
Combination of drug therapy[d]			
CT−, HT+	1.03	0.95	(0.38–2.82)
CT+, HT−	1.50	0.57	(0.37–6.06)
CT+, HT+	2.27	0.10	(0.85–6.05)
Type of insurance[e]			
Association-Kenpo (AK)	0.93	0.85	(0.47–1.87)
Mutual aid association (MAA)	0.42	0.18	(0.12–1.47)

OR: Odds Ratio; 95%CI: confidence intervals.
[a]40–49.
[b]breast-conserving surgery (BCS).
[c]BCS, ALND−
[d]CT−, HT−
[e]Health Insurance Associations (HIA).

Appendix 2.

The breast reconstruction rate in this medical facility was as follows.
11.0% (2012), 11.5% (2013), 14.6% (2014)