

Physicians' knowledge, attitude, and behavior regarding fertility issues for young breast cancer patients: a national survey for breast care specialists

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Abstract

Background Fertility is one of the key aspects of quality of life for breast cancer patients of childbearing age. The objective of this study was to describe fertility-related practice for young breast cancer patients in Japan and to identify healthcare provider factors that contribute to physicians' behavior towards fertility preservation.

Methods A cross-sectional survey was developed in order for Japanese breast cancer specialists ($n = 843$) to self-evaluate their knowledge, attitude, and behavior regarding fertility preservation. Survey items included questions regarding knowledge of and attitude toward fertility issues in cancer patients, fertility-related practice, potential barriers for the discussion of fertility with patients, and responding physicians' socio-demographic background.

Results Four hundred and thirty-four (52%) breast oncologists responded to the survey. Female and younger oncologists (age less than 50 years) had significantly higher probability of referring patients to reproductive

specialists. Physicians who had better knowledge score and positive attitudes toward fertility preservation were more likely to discuss potential fertility issues with cancer patients. This was significantly associated with consultation and referral to reproduction specialists when encountering fertility issues with cancer patients. Risk of recurrence, lack of collaborating reproductive specialists, and time constraints in the clinic were identified as major barriers to discussion of fertility preservation with breast cancer patients.

Conclusion Female and younger physicians as well as physicians working in a multidisciplinary environment had positive attitudes and behavior towards fertility preservation in breast cancer patients. The development of comprehensive and interdisciplinary programs for healthcare providers is necessary to meet the expectations and fertility needs of breast cancer patients.

Keywords Fertility preservation · Breast cancer · Survivorship

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Introduction

With improvement of cancer prognosis, fertility has become one of the key aspects of quality of life for breast cancer patients of childbearing age. Distress about interrupted childbearing is likely to persist in long-term female cancer survivors [1]. The American Society of Clinical Oncology (ASCO) has developed guidance for oncologists regarding available fertility preservation methods and related issues [2]: oncologists should address the possibility of infertility with patients during their reproductive years and be prepared to discuss possible fertility preservation options or refer appropriate and interested patients to

reproductive specialists as early as possible during treatment planning.

However, previous studies have shown that only 23% of the patients younger than 40 years of age were informed of potential infertility after cancer treatment in a single institution in Japan and less than half of oncologists were following the ASCO guideline in the USA [3, 4]. The practice of oncologists regarding fertility preservation in cancer patients of reproductive age may depend on multiple factors: the patient's medical and psychosocial condition [5, 6], the patient's knowledge [7], and physicians' knowledge about fertility preservation [8].

We have previously analyzed the decision-making process for adjuvant treatment in young breast cancer patients of reproductive age [3]. Significantly less patients expressed interest in fertility when they had children or advanced disease. Less aggressive treatment (without chemotherapy) was recommended by oncologists for patients who voluntarily expressed an interest in preserving fertility [3]. Nearly one-third of the patients who expressed an interest in fertility selected a different adjuvant treatment from the primary recommendation of the oncologist because of their concern for preserving fertility, whereas the majority of patients who did not express an interest in preserving fertility followed the oncologists' primary recommendation [3].

The awareness and attitude of patients in the clinic might reflect the ability of healthcare providers to provide an environment in which patients could bring up fertility issues. The objectives of this study include describing fertility-related practice for breast cancer patients in a variety of clinical settings in Japan and identifying healthcare provider factors that contribute to physicians' behavior regarding fertility preservation in young breast cancer patients.

Methods

Selection of participant

A cross-sectional survey was developed in order for board-certified breast oncologists of the Japanese Breast Cancer Society (JBCS), who are the main physicians treating breast cancer patients in Japan, to self-evaluate their knowledge, perception, and behavior regarding fertility issues in young breast cancer patients.

Measures

The survey consisted of 49 items including questions regarding knowledge of and attitudes towards fertility in cancer patients, practice behavior of fertility-related discussions with patients, potential barriers for these

discussions, and demographic background of the practitioners (Table 1). Survey items were derived from existing literature and multidisciplinary discussion. Physicians were asked to evaluate their agreement with the statements using a five-grade system (1, strongly agree; 2, agree; 3, cannot decide; 4, disagree; 5, strongly disagree).

1. Knowledge about fertility issues in breast cancer patients

To evaluate the accuracy of knowledge about fertility issues in breast cancer patients, the statements were developed from the latest JBCS treatment guideline [5]. For statements A-1 and A-4, the respondents were considered to have more accurate knowledge when the score was lower. For statements A-2 and A-3, the respondents were considered to have more accurate knowledge when the score was higher. Then the sum of $(5 - \text{"score for A-1"}) + (\text{"score for A-2"}) + (\text{"score for A-3"}) + (5 - \text{"score for A-4"})$ was calculated. The respondents with a higher sum were considered to have more accurate overall knowledge. A-5 was not used to evaluate the accuracy of knowledge because of lack of definite evidence, but correlated with the use of LHRH agonist for fertility preservation.

2. Practice behavior for breast cancer patients of reproductive age

Practice behavior statements consisted of 13 items including statements used in the US oncologist survey with some modifications to adapt to Japanese practice setting. The statements "I discuss the impact of cancer treatment on future fertility with my patients", "I consult reproductive specialists with questions about fertility issues in my patients", and "I refer patients who have questions about fertility to reproductive specialists" were considered the most important behavior according to the ASCO guideline [2].

3. Potential barriers for discussing fertility issues with breast cancer patients

Among seven potential barriers asked in the questionnaire, four were similar to statements used in the US survey [4]. We put three additional statements (patients' voluntary expression of interest, existence of spouse/partner, and support from co-medical staff) that were created by findings from our previous study [2] and by considering Japanese culture. In addition, we asked the participant to describe the greatest difficulty in discussing fertility in an open question.

4. Attitude towards fertility preservation of cancer patients

Five statements were selected from the US survey [4]. Because the hereditary aspect of breast cancer was considered to be not genuinely linked with perception of

Table 1 Questionnaire statements

-
- A. Knowledge about fertility issues of breast cancer patients**
1. Total dose of alkylating agents are related to infertility
 2. Pregnancy after breast cancer increases risk of recurrence
 3. Pregnancy after chemotherapy increases risk of deformity of the child
 4. Pregnancy should be avoided during tamoxifen treatment
 5. Luteinizing hormone releasing hormone (LHRH) analogue reduces the risk of chemotherapy-induced amenorrhea
- B. Practice behavior**
1. Patients voluntarily bring up the fertility issues in the clinic
 2. I discuss the impact of cancer treatment to future fertility with my patients
 3. I do not feel comfortable to discuss fertility issue with my patients
 4. I take into account the history of childbirth when I discuss fertility issue with my patient
 5. I take into account whether she has a spouse/partner when I discuss fertility issue with my patient
 6. I take into account economical status of the patient when I discuss fertility issue with my patient
 7. I discuss fertility issues with breast cancer patients with high risk of recurrence
 8. Patients talk to co-medical staff about their concern about fertility
 9. I ask co-medical staff if a patient has an interest in fertility
 10. I provide my patients with educational material about fertility preservation
 11. I use LHRH analogue to preserve fertility
 12. I consult a reproductive specialist with questions about fertility issues in my patients
 13. I refer patients who have questions about fertility to reproductive specialists
- C. Barriers for discussing fertility issues**
1. The patient does not express their interest in fertility
 2. The patient has high risk of recurrence
 3. The patient has economic problems
 4. The patient does not have a spouse/partner
 5. There is no place/person to refer my patients to for fertility preservation
 6. Time constraints affect my ability to discuss fertility preservation
 7. There is no support from co-medical staff
 8. What is the greatest difficulty in discussing fertility issues with young breast cancer patients?
- D. Attitude toward fertility preservation**
1. Patients with poor prognosis should not pursue fertility preservation
 2. Posthumous parenting is troublesome for bereaved family
 3. Losing mothers will negatively affect bereaved children
 4. I fear passing hereditary cancer to a biological child
 5. Treating cancer is more important than fertility preservation
- E. Demographics and medical backgrounds**
1. What is your gender?
-

Table 1 continued

-
2. What is your age?
 3. What is your religious background?
 4. When did you graduate from medical school?
 5. What is your specialty?
 6. Where is your primary practice located?
 7. What kind of institution do you practice in?
 8. Is your institution a community-base hospital for cancer care?
 9. How many physicians are in your practice setting including you?
 10. Are there any female physicians in your practice setting?
 11. Are there any medical oncologists in your practice setting?
 12. Are there any breast cancer specialized nurses in your practice setting?
 13. Are there any cancer-specialized pharmacists in your practice setting?
 14. Is there a genetic counseling clinic in your practice setting?
 15. In a typical week, how many breast cancer surgeries are performed in your practice setting?
 16. In a typical week, how many breast cancer patients under 40 years of age do you see?
 17. Do you have a spouse/partner?
 18. Do you have children?
 19. Do you have relatives or close friends who passed away leaving behind minor children?
-

fertility preservation, the item was not included in our analysis. Participants were considered to be positive toward fertility preservation if the sum of scores was higher than 3. The sum of scores for statements from D-1 through D-5 was calculated and the respondents with higher total score were considered as physicians with a “positive attitude” towards fertility preservation.

5. Individual and institutional background

The items included physicians’ gender, age, religious background, length of professional career, and specialty. We also asked for a description of the practicing institution: the number of breast surgeries, the number of young breast cancer patients, presence of female colleagues in the team, the presence of one or more medical oncologist(s), breast cancer certified clinical nurse specialist (CNS), and board-certified pharmacists in the institution.

Procedures

The study was carried out according to the National Guideline for Epidemiological Studies. The names of study participants and the institutions of breast oncologists were obtained from the JBCS website. After confirmation of each physician’s affiliation, anonymous paper surveys were sent out to all 843 breast oncologists by mail with a return

postage-paid envelope. The survey was sent out on 28 May 2010 and the mailed surveys postmarked by 31 July were included in the analysis. The consent from the participants was waived because of the anonymity of the survey. No honorarium was offered for completing the survey.

Data analysis

All analyses were conducted using IBM SPSS statistics version 18. Accuracy of knowledge about fertility was scored on the basis of four questions (A-1, 2, 3, 4, Table 1) concerning the standard knowledge about chemotherapy and the effect of chemotherapy on fertility. Respondents with appropriate knowledge were considered “accurate”. Four questions (D-1, 2, 3, 5, Table 1) concerning the perspective and opinion about the fertility preservation were asked and scored as attitude score. Respondents were divided into “positive attitude group” and “negative attitude group” depending on the attitude score. Chi-square test was applied for correlation analysis between physician knowledge, attitude, and background. Physicians’ background demographics, knowledge, and attitude regarding fertility issues were associated with physicians’ practice behavior regarding fertility issues. Odds ratios (OR) and their 95% confidence interval (CI) were estimated to compare physician background factors, knowledge, and attitude with physician practice pattern, using simple and multivariable logistic regression models. All p values are two sided, and the statistical significance level was set at $p < 0.05$. No adjustments for multiple comparisons were considered because of the exploratory nature of this study.

Results

Response rate

The response rate was calculated as the number of breast oncologists completing the survey ($n = 434$) divided by the initial sample size minus undeliverable ($843 - 8 = 835$): this yielded a 52% response rate. This is higher than the previous survey on fertility preservation referral targeting oncology specialists in the USA [4].

Demographic and characteristics of responding breast oncologists

The background of respondents is shown in Table 2. A total of 16.6% of the respondents were female. More than 95% of the respondents were experienced physicians reflecting the requirement of basic board certification in general medicine, surgery, radiation oncology, or pathology in order to obtain JBCS Breast Oncologists

certification. The majority was surgeons. Less than half responded that they have medical oncologists in their institutions. About 70% were the institutions in which they operated on less than five breast cancer patients per week (less than approximately 200 cases per year).

Association between knowledge, attitude, and physician background

Two hundred and seventy-nine (64%) respondents were considered to have accurate knowledge. Accuracy of knowledge about fertility was correlated with the number of young breast cancer patients treated ($p = 0.006$), presence of children of the physician ($p = 0.01$), age of the physician ($p = 0.019$), and the presence of female colleagues ($p = 0.019$).

The existence of a spouse/partner ($p = 0.011$), age ($p = 0.032$), and gender ($p = 0.023$) of the physician were the factors significantly correlated with a positive attitude toward fertility considerations of breast cancer patients. Physicians who have a spouse/partner, physicians who are younger than 50 years, and female physicians had more positive attitudes toward fertility issues for breast cancer patients.

Practice of fertility issues among breast oncologists

A total of 83% of the participants responded that they were positive in discussing fertility issues with young breast cancer patients.

Twenty-one percent responded that patients voluntarily bring up fertility issues in the clinic. Physicians who treat two or more young patients per week perceived that patients voluntarily express their concern in the clinic compared to physicians who treat fewer (OR 1.84, 95% CI 1.13–3.00, $p = 0.008$). Physicians who treat two or more young patients per week (OR 1.30, 95% CI 1.05–2.45, $p = 0.023$), who have board-certified nurse colleagues (OR 1.55, 1.19–2.03, $p < 0.001$) and have more than six breast surgeries per week (OR 1.20, 1.02–1.41, $p = 0.014$) responded that they perceived that patients talk to co-medical staff about their concerns about fertility. A total of 24% of the respondents consulted reproductive specialists when they encountered fertility problems in their patients and 42% referred patients to reproductive specialists when patients expressed concerns regarding fertility.

The association between physicians’ behavior related to fertility issues and their knowledge, attitude, and background demographics are shown in Table 3. Fair knowledge had the strongest impact on physicians’ positive behavior towards discussing fertility issue with patients. Positive attitude, presence of breast cancer-specialized CNS, young age, and female gender were also significant

Table 2 Demographic background of the responding physicians

	<i>n</i>	%
Total	434	100
Gender		
Female	72	16.6
Male	357	82.3
Unknown	5	1.2
Age		
20–29	1	0.2
30–39	52	12.0
40–49	183	42.2
50–59	148	34.1
60–69	41	9.4
70–	4	0.9
Unknown	5	1.2
Religion		
Buddhist	144	33.2
Christian	9	2.1
No special religion	276	63.5
Others	5	1.2
Year graduated from medical school		
–1994	347	80.0
1995–2000	76	17.5
2001–2005	6	1.4
Unknown	5	1.2
Specialty		
Surgery	412	94.9
Medical oncology	6	1.4
Radiation oncology	9	2.1
Gynecology	1	0.2
Others	6	1.4
Type of affiliation		
Cancer center	40	9.2
General hospital	190	43.8
University hospital	122	28.1
Private clinic	74	17.1
Unknown	8	1.8
Number of physicians		
1–3	164	37.8
4–7	137	31.8
8–	125	28.8
Unknown	8	1.8
Female physician colleague		
Present	276	63.6
Absent	150	34.6
Unknown	8	1.8
Medical oncologist		
Present	172	39.6
Absent	255	58.8
Unknown	7	1.6

Table 2 continued

	<i>n</i>	%
Breast cancer specialized nurse		
Present	202	46.5
Absent	225	51.8
Unknown	7	1.6
Board-certified pharmacists		
Present	227	52.3
Absent	196	45.2
Unknown	11	2.5
Number of breast surgeries (per week)		
0–5	310	71.4
5–10	85	19.5
11–15	14	3.2
16–20	3	0.7
20–	14	3.2
Unknown	8	1.8
Number of patients aged <40 (per week)		
0–1	122	28.1
2–4	202	46.5
5–	103	23.7
Partner/spouse		
Present	401	92.4
Absent	25	5.8
Unknown	8	1.8
Children		
Present	351	80.9
Absent	64	14.7
Unknown	19	4.4

factors associated with positivity towards the discussion. Female oncologists and medical oncologists were more likely to take into account patients' social backgrounds such as history of childbirth, presence of a spouse/partner, and patients' economic status when discussing fertility issues.

Physicians with a positive attitude, physicians younger than 50 years, and female physicians were more likely to discuss fertility issues with patients with poorer prognoses. Positive attitude was the strongest factor related to consultation and referral to reproductive specialists.

Barriers for discussion with patients

High risk of disease recurrence (51%), lack of reproductive specialists or infertility clinic for referral (45%), and time constraints in the clinic (45%) were regarded as major barriers for discussing fertility issues. When only physicians who were negative in discussing fertility issues ($n = 69$) were analyzed, high risk of recurrence (57%), no signal of interest in fertility from patients (49%), and lack

Table 3 Factors associated with fertility-related practice behavior

	I discuss the impact of cancer treatment on future fertility with my patients				I do not feel comfortable discussing fertility issues with my patients				I take into account the history of childbirth when I discuss fertility issues with my patients			
	<i>p</i>	OR	95% CI		<i>p</i>	OR	95% CI		<i>p</i>	OR	95% CI	
			Min	Max			Min	Max			Min	Max
Knowledge												
Fair	0.000	1.717	1.321	2.231	0.063				0.799			
Not fair		1.000										
Attitude												
Conservative	0.012	1.000			0.180				0.697			
Aggressive		1.542	1.145	2.079								
Gender												
Female	0.005	1.166	1.080	1.258	0.807				0.022	1.130	1.041	1.227
Male		1.000								1.000		
Age												
<50	0.000	1.584	1.280	1.959	0.203				0.625			
>50		1.000										
Specialty												
Surgery	1.000				0.625				0.756			
Others												
Affiliation												
University hospital/cancer center	0.032	1.235	1.047	1.457	0.147				0.900			
General hospital/private hospital		1.000										
Female physician colleague												
Present	0.079				1.000				1.000			
Absent												
Medical oncologist colleague												
Present	0.432				0.366				0.043	1.190	1.003	1.141
Absent												
Breast cancer-specialized nurse												
Present	0.606				0.480				0.327			
Absent												
Board-certified cancer pharmacist												
Present	0.001	1.510	1.220	1.868	0.721				0.324			
Absent		1.000										
Number of breast surgeries per week												
1–5	0.884				0.692				0.495			
6–												
Number of young patients per week												
0–1	0.474				0.113				0.500			
2–												
Partner/spouse												
Present	0.281				0.008	1.000			0.193			
Absent						1.158	0.989	1.355				
Children												
Present	0.074				0.088				0.740			
Absent												

Table 3 continued

	I take into account whether she has a spouse/partner when I discuss fertility issues with my patients				I take into account economical status of the patient when I discuss fertility issues with my patients				I discuss fertility issues with breast cancer patients with high risk of recurrence			
	<i>p</i>	OR	95% CI		<i>p</i>	OR	95% CI		<i>p</i>	OR	95% CI	
			Min	Max			Min	Max			Min	Max
Knowledge												
Fair	0.839				0.609				0.910			
Not fair												
Attitude												
Conservative	0.601				0.694				0.001	1.000		
Aggressive									1.640	1.250	2.150	
Gender												
Female	0.033	1.089	1.002	1.185	0.622				0.047	1.089	1.000	1.185
Male									1.000			
Age												
<50	0.326				0.267				0.003	1.391	1.131	1.712
>50												
Specialty												
Surgery	0.225				0.343				0.273			
Others												
Affiliation												
University hospital/cancer center	0.364				1.000				0.219			
General hospital/private hospital												
Female physician colleague												
Present	0.412				0.194				0.649			
Absent												
Medical oncologist colleague												
Present	0.022	1.206	1.032	1.408	0.043	1.261	0.996	1.596	1.000			
Absent		1.000				1.000						
Breast cancer specialized nurse												
Present	0.434				1.000				0.588			
Absent												
Board-certified cancer pharmacist												
Present	0.694				0.136				0.745			
Absent												
Number of breast surgeries per week												
1–5	0.125				0.262				0.903			
6–												
Number of young patients per week												
0–1	0.746				0.273				0.810			
2–												
Partner/spouse												
Present	0.299				0.192				1.000			
Absent												
Children												
Present	0.183				1.000				0.025	1.116	1.029	1.211
Absent									1.000			

Table 3 continued

	I ask co-medical staff if a patient has an interest in fertility			I provide my patients with educational material about fertility preservation			I use LHRH analogue to preserve fertility					
	<i>p</i>	OR	95% CI		<i>p</i>	OR	95% CI		<i>p</i>	OR	95% CI	
			Min	Max			Min	Max			Min	Max
Knowledge												
Fair	0.242				0.125				0.653			
Not fair												
Attitude												
Conservative	0.895				0.100				0.248			
Aggressive												
Gender												
Female	0.133				0.047	1.183	0.973	1.440	0.399			
Male												
Age												
<50	0.262				0.416				0.914			
>50												
Specialty												
Surgery	0.105				0.066				0.057			
Others												
Affiliation												
University hospital/cancer center	0.795				0.046	1.000			0.656			
General hospital/private hospital						1.671	0.959	2.911				
Female physician colleague												
Present	0.793				0.026	1.919	1.014	3.632	0.259			
Absent						1.000						
Medical oncologist colleague												
Present	0.443				0.407				0.381			
Absent												
Breast cancer-specialized nurse												
Present	0.316				0.871				0.516			
Absent												
Board-certified cancer pharmacist												
Present	0.900				0.325				0.663			
Absent												
Number of breast surgeries per week												
1–5	1.000				0.273				0.402			
6–												
Number of young patients per week												
0–1	0.583				0.721				1.000			
2–												
Partner/spouse												
Present	0.192				1.000				0.828			
Absent												
Children												
Present	0.614				1.000				0.156			
Absent												

Table 3 continued

	I consult a reproductive specialist with questions about fertility issues in my patients				I refer patients who have questions about fertility to reproductive specialists			
	<i>p</i>	OR	95% CI		<i>p</i>	OR	95% CI	
			Min	Max			Min	Max
Knowledge								
Fair	0.442				0.162			
Not fair								
Attitude								
Conservative	0.032	1.000			0.003	1.656	1.183	2.319
Aggressive		1.599	1.014	2.798		1.000		
Gender								
Female	0.039	1.121	0.995	1.277	0.001	1.176	1.062	1.302
Male		1.000				1.000		
Age								
<50	0.264				0.004	1.424	1.110	1.828
>50						1.000		
Specialty								
Surgery	1.000				0.795			
Others								
Affiliation								
University hospital/cancer center	0.007	1.349	1.067	1.706	0.012	1.243	1.047	1.474
General hospital/private hospital						1.000		
Female physician colleague								
Present	0.051	1.467	0.995	2.164	0.123			
Absent		1.000						
Medical oncologist colleague								
Present	0.103				0.042	1.212	1.011	1.453
Absent						1.000		
Breast cancer-specialized nurse								
Present	0.710				1.000			
Absent								
Board-certified cancer pharmacist								
Present	0.803				0.138			
Absent								
Number of breast surgeries per week								
1–5	0.785				1.000			
6–								
Number of young patients per week								
0–1	0.270				0.813			
2–								
Partner/spouse								
Present	0.807				0.670			
Absent								
Children								
Present	0.197				0.209			
Absent								

of reproductive specialists or infertility clinic for referral (38%) were the major causes for them not to discuss fertility with patients.

Discussion

This study describes the attitude of the main providers of breast cancer treatment in Japan towards fertility issues in young breast cancer patients. The high response rate to our survey in a relatively short time indicates the interest of breast oncologists in fertility issues. More than 80% of the participants responded that they had a positive attitude when discussing fertility issues in the clinic, but this result may be biased by the respondents' interest in fertility issues. The recent awareness of fertility issues among Japanese breast oncologists may be related to the publication of the ASCO guideline in 2006 and the inclusion of fertility-related contents in JBCS patient guideline 2009 [2, 9]. Indeed, the JBCS treatment guideline, the standard textbook for board certification of Breast Oncologists, updated its contents to cover fertility-related issues in July 2010 [10].

The physicians with a positive attitude and working in institutions with medical oncologists and/or female colleagues had a higher likelihood of consultation or referral to reproductive specialists. The likelihood of referring to reproductive specialists was slightly higher in female physicians, which was consistent with the results of the survey in the USA [4]. These results indicate that participation of female healthcare providers in the team and a multidisciplinary working environment might enhance physicians' awareness of and behavior toward fertility-related issues. Because knowledge and attitude seem to be influenced by gender, personal experience, and the working environment of the physicians, we think that outreach with educational materials and systematic learning opportunities for healthcare providers would be helpful in expanding knowledge and performance regarding fertility issues in young breast cancer patients.

High risk of disease recurrence was considered the greatest barrier for physicians, similar to the results of other studies [5, 6]. In our previous study, patients' with higher risk of disease recurrence did not voluntarily express their concerns regarding fertility when compared to patients of lower risk of disease recurrence [3]. Both patients and physicians may refrain from discussing future fertility when the estimation of prognosis of the cancer is poor. Although early referral to reproductive specialists might increase the patients' likelihood of receiving reproductive intervention and improve the fertility outcome [11, 12], fertility preservation techniques such as embryo preservation and oocyte preservation connote ethical issues especially in patients with poor prognosis [13]. Ethical and

psychosocial support is necessary in the shared decision-making process among patients, families, and physicians.

A lack of reproductive specialists or infertility clinic for referral is a real problem. A survey in the USA showed that many breast cancer clinicians reported that they do not have knowledge of or resources for fertility preservation [8, 14]. Interdisciplinary communication between reproductive specialists and oncologists is necessary.

Early case–control studies suggest that pregnancy after primary treatment of breast cancer does not have a negative impact on cancer prognosis, although “healthy mother” bias might exist [15]. Because prognostication of breast cancer has become individualized using genetic biomarkers [16, 17], further investigations to clarify the impact of pregnancy after primary treatment on an individual basis is needed so that patients can personalize their decision-making regarding both cancer treatment and fertility.

In conclusion, Japanese breast oncologists were in general positive in discussing fertility issues with young breast cancer patients. Female and younger physicians as well as physicians working in a multidisciplinary environment had more positive attitudes and behavior towards fertility preservation. The development of multidisciplinary and interdisciplinary programs is necessary to meet the fertility needs of breast cancer patients.

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