

Original Article



Current status of hereditary breast and ovarian cancer practice among gynecologic oncologists in Japan: a nationwide survey by the Japan Society of Gynecologic Oncology (JSGO)

OPEN ACCESS

Received: Mar 5, 2022
Revised: Apr 29, 2022
Accepted: Jun 23, 2022
Published online: Jul 18, 2022

Correspondence to

Daisuke Aoki

Department of Obstetrics and Gynecology,
Keio University School of Medicine, 35
Shinanomachi, Shinjuku-ku, Tokyo 160-8582,
Japan.
Email: aoki@z7.keio.jp

© 2022. Asian Society of Gynecologic
Oncology, Korean Society of Gynecologic
Oncology, and Japan Society of Gynecologic
Oncology

This is an Open Access article distributed
under the terms of the Creative Commons
Attribution Non-Commercial License (<https://creativecommons.org/licenses/by-nc/4.0/>)
which permits unrestricted non-commercial
use, distribution, and reproduction in any
medium, provided the original work is properly
cited.

ORCID iDs

Yusuke Kobayashi
<https://orcid.org/0000-0002-4503-2845>
Kenta Masuda
<https://orcid.org/0000-0003-4313-1636>
Akira Hiraswa
<https://orcid.org/0000-0003-4124-5488>
Kazuhiro Takehara
<https://orcid.org/0000-0001-8808-3338>
Hitoshi Tsuda
<https://orcid.org/0000-0003-3457-4224>
Yoh Watanabe
<https://orcid.org/0000-0003-1490-5313>
Katsutoshi Oda
<https://orcid.org/0000-0002-2468-9573>

Yusuke Kobayashi ¹, Kenta Masuda ¹, Akira Hiraswa ², Kazuhiro Takehara ³,
Hitoshi Tsuda ⁴, Yoh Watanabe ⁵, Katsutoshi Oda ⁶, Satoru Nagase ⁷,
Masaki Mandai ⁸, Aikou Okamoto ⁹, Nobuo Yaegashi ¹⁰, Mikio Mikami ¹¹,
Takayuki Enomoto ¹², Daisuke Aoki ¹, Hidetaka Katabuchi ¹³,
Working Group on Clinical Practice for Cancer Genomic Medicine and HBOC,
Japan Society of Gynecologic Oncology

¹Department of Obstetrics and Gynecology, Keio University School of Medicine, Tokyo, Japan

²Department of Clinical Genomic Medicine, Graduate School of Medicine, Dentistry and Pharmaceutical Sciences, Okayama University, Okayama, Japan

³Department of Gynecologic Oncology, National Hospital Organization Shikoku Cancer Center, Ehime, Japan

⁴Department of pathology, National Defense Medical College Hospital, Saitama, Japan

⁵Division of Obstetrics and Gynecology, Faculty of Medicine, Tohoku Medical and Pharmaceutical University, Miyagi, Japan

⁶Division of Integrative Genomics, Graduate School of Medicine, The University of Tokyo, Tokyo, Japan

⁷Department of Obstetrics and Gynecology, Yamagata University Faculty of Medicine, Yamagata, Japan

⁸Department of Gynecology and Obstetrics, Graduate School of Medicine, Kyoto University, Kyoto, Japan

⁹Department of Obstetrics and Gynecology, The Jikei University School of Medicine, Tokyo, Japan

¹⁰Department of Obstetrics and Gynecology, Tohoku University Graduate School of Medicine, Sendai, Japan

¹¹Department of Obstetrics and Gynecology, Tokai University, Kanagawa, Japan

¹²Department of Obstetrics and Gynecology, Niigata University Graduate School of Medical and Dental Sciences, Niigata, Japan

¹³Kumamoto University, Kumamoto, Japan

ABSTRACT

Objective: The practices pertaining to hereditary breast and ovarian cancer (HBOC) in Japan have been rapidly changing owing to the clinical development of poly(ADP-ribose) polymerase inhibitors, the increasing availability of companion diagnostics, and the broadened insurance coverage of HBOC management from April 2020. A questionnaire of gynecologic oncologists was conducted to understand the current status and to promote the widespread standardization of future HBOC management.

Methods: A Google Form questionnaire was administered to the members of the Japan Society of Gynecologic Oncology. The survey consisted of 25 questions in 4 categories: respondent demographics, HBOC management experience, insurance coverage of HBOC management, and educational opportunities related to HBOC.

Results: A total of 666 valid responses were received. Regarding the prevalence of HBOC practice, the majority of physicians responded in the negative and required human resources,

Satoru Nagase 
<https://orcid.org/0000-0001-5212-1128>
 Masaki Mandai 
<https://orcid.org/0000-0003-4428-8029>
 Aikou Okamoto 
<https://orcid.org/0000-0002-5079-0464>
 Nobuo Yaegashi 
<https://orcid.org/0000-0003-2521-039X>
 Mikio Mikami 
<https://orcid.org/0000-0002-7496-3518>
 Takayuki Enomoto 
<https://orcid.org/0000-0003-4538-5541>
 Daisuke Aoki 
<https://orcid.org/0000-0002-9596-8326>
 Hidetaka Katabuchi 
<https://orcid.org/0000-0002-2403-6134>

Conflict of Interest

Dr. Kobayashi reports grants and personal fees from Takeda Pharmaceutical Co., Ltd., personal fees from AstraZeneca K.K., Chugai Pharmaceutical Co., Ltd. Dr. Hirasawa reports personal fees from ACTmed Co. Ltd. Dr. Takehara reports personal fees from Takeda Pharmaceutical Co., Ltd. and AstraZeneca K.K. Dr. Aoki reports personal fees from Takeda Pharmaceutical Co., Ltd., AstraZeneca K.K., Chugai Pharmaceutical Co., Ltd., MSD K.K. The other authors have nothing to disclose.

Author Contributions

Conceptualization: K.Y., M.K., H.A., T.K., T.H., W.Y., O.K., N.S., ¹M.M., O.A., Y.N., ²M.M., E.T., A.D., K.H.; Formal analysis: K.Y., M.K., A.D.; Investigation: K.Y., M.K., A.D.; Methodology: K.Y., M.K., A.D.; Resources: A.D., K.H.; Supervision: T.K., T.H., W.Y., O.K., N.S., ¹M.M., O.A., Y.N., ²M.M., E.T., A.D., K.H.; Validation: K.Y., M.K., A.D.; Writing - original draft: K.Y.; Writing - review & editing: M.K., H.A., T.K., T.H., W.Y., O.K., N.S., ¹M.M., O.A., Y.N., ²M.M., E.T., A.D., K.H.

¹M.M., Masaki Mandai; ²M.M., Mikio Mikami

information sharing and educational opportunities, and expanded insurance coverage to adopt and improve HBOC practice. Most physicians were not satisfied with the educational opportunities provided so far, and further expansion was desired. They remarked on the psychological burdens of many HBOC managements. Physicians reported these burdens could be alleviated by securing sufficient time to engage in HBOC management, creating easy-to-understand explanatory material for patients, collaboration with specialists in genetic medicine, and educational opportunities.

Conclusion: Gynecologic oncologists in Japan are struggling to deal with psychological burdens in HBOC practice. To promote the clinical practice of HBOC management, there is an urgent need to strengthen human resources and improve educational opportunities, and expand insurance coverage for HBOC management.

Keywords: Hereditary Breast and Ovarian Cancer Syndrome; Obstetrics and Gynecology Department, Hospital; Genetic Testing; Insurance Coverage; Poly(ADP-Ribose) Polymerase Inhibitors

Synopsis

Japan Society of Gynecologic Oncology conducted a survey on the current status of hereditary breast and ovarian cancer (HBOC) practice. About half of the 666 respondents did not feel that HBOC practice had become common, and the majority answered HBOC practice in Japan was not widespread. There is a need to strengthen human resources and educational content, and to reexamine the items covered by insurance.

INTRODUCTION

Hereditary breast and ovarian cancer (HBOC) is an autosomal dominant tumorigenic syndrome that increases the risk of breast, ovarian, pancreatic, and prostate cancers, primarily caused by germline variants in the *BRCA1* or *BRCA2* genes. In Japan, 1.45% and 2.71% of breast cancer cases have *BRCA1* and *BRCA2* pathogenic variants, respectively [1]. In patients with ovarian cancer, 8.3%–9.9% and 3.5%–4.7% had *BRCA1* and *BRCA2* pathogenic variants, respectively [2,3]. The cumulative risk of breast cancer in *BRCA1* and *BRCA2* pathogenic variant carriers is 72% and 69%, respectively, by the age of 80 years and 44% and 17%, respectively, by the age of 80 years for ovarian cancer [4]. These figures are high considering that the lifetime incidence rates for breast and ovarian cancer for women without *BRCA1* or *BRCA2* are 12.9% and 1.3%, respectively [5,6]. Therefore, surveillance and risk-reduction strategies are more important for patients with a genetic predisposition for HBOC.

For gynecologic oncologists in Japan, the approval of poly(ADP-ribose) polymerase (PARP) inhibitors for ovarian cancer in 2018 has led to increased *BRCA* genetic and homologous recombination deficiency (HRD) testing as companion diagnostics, which increases the opportunity to diagnose patients with HBOC from among those with ovarian cancer. In addition, as of April 2020, insurance coverage now partially covers HBOC management, such as *BRCA* genetic testing and surveillance for patients with ovarian cancer, and risk-reducing salpingo-oophorectomy (RRSO) for patients with a history of breast cancer. This expansion in coverage has changed the practice landscape for gynecologic oncologists. The role of gynecologic oncologists is also expanding as the social situation as regards to HBOC practice continues to evolve. Understanding whether the current clinical setting can appropriately adapt to the rapid progress being made in HBOC practice is essential. Therefore, a survey on

the actual status of HBOC practice among gynecologic oncologists in Japan was conducted with the aim of understanding clinical practice patterns and to promote the widespread standardization of future HBOC management.

MATERIALS AND METHODS

A Google Form questionnaire (**Data S1**) was administered to the members of the Japan Society of Gynecologic Oncology (JSGO) in January 2021. The survey consisted of 25 questions in 4 sections: respondent demographics, HBOC management experience, insurance coverage for HBOC management, and educational opportunities related to HBOC. Questions 20 and 21, which were open-ended responses, were excluded from this analysis.

RESULTS

1. Respondent demographics

A total of 666 valid responses were obtained, and the characteristics of the individuals and their institutions are listed in **Table 1**. As for the demographics of the respondents, 97.9% practiced obstetrics and gynecology as their main specialty (data not shown, answer to Q1), and 55.5% had 10–25 years of experience (10–15 years, 19.2%; 15–20 years, 18.3%; 20–25 years, 18.0%). Most medical specialties included Board Certified Obstetrics and Gynecologist of Japan Society of Obstetrics and Gynecology (98.5%), Board Certified Specialist of Japanese Board of Cancer Therapy (69.4%), and Board Certified Gynecologist of JSGO (58.6%), in addition to Board Certified of Japanese Board of Medical Genetics and Genomics, Clinical Genetics (10.1%) as specialists in genetic practice. Most physicians were affiliated with a general hospital (45.9%), followed by a university hospital (37.1%) and a center hospital (including cancer centers) (11.1%). Affiliations with outpatient offices/clinics, gynecology hospitals, and governmental institutions were less common. Most physicians practiced in Tokyo (18.0%), followed by Osaka (8.9%), Fukuoka (6.9%), Kanagawa (6.6%), and Aichi (4.1%). Most respondents had their own genetics department (51.6%), and 54.4% were involved in cancer genome medicine as a designated medical institution.

2. HBOC management experience

Approximately 73.9% of the respondents were able to devote 0%–5% of their efforts toward HBOC practice, and 18.0% were able to devote slightly more, i.e., 5%–10% of their time (**Table 2**). More than 90% of the respondents were unable to devote more than 10% of their efforts toward HBOC practice, which suggested that HBOC practice was limited owing to time constraints in terms of clinical practice. As for whether the respondents were familiar with the etiology and practice of HBOC, the majority of the respondents answered in the affirmative, with 9.6% agreeing strongly and 46.5% agreeing somewhat (**Fig. 1A**). Those who responded in the negative (43.8%) requested for educational opportunities related to HBOC (83.6%), study about genetics (70.9%), or support from healthcare professionals specialized in genetic medicine (68.5%) (**Fig. 1A**). With regard to the prevalence of HBOC practice in Japan, the majority of respondents (80.1%) responded in the negative (somewhat disagree, 71.5%; strongly disagree, 8.6%), whereas 20.0% of the respondents responded in a positive manner (strongly agree, 0.2%; somewhat agree, 19.8%) (**Fig. 1B**). Respondents who responded in the negative required additional support in human resources, such as healthcare professionals specializing in genetic medicine (72.8%), information sharing and

Table 1. Characteristics of the respondents and their institutions

Characteristics	No. (%)
Years of experience as a physician (Answer to Q2)	
0–5	0
5–10	42 (6.3)
10–15	128 (19.2)
15–20	122 (18.3)
20–25	120 (18.0)
25–30	99 (14.9)
30–35	83 (12.5)
35–40	49 (7.4)
40–	25 (3.8)
Certified specialties (Answer to Q3, multiple selections allowed)*	
Board Certified Obstetrics and Gynecologist of Japan Society of Obstetrics and Gynecology	656 (98.5)
Board Certified Specialist of Japanese Board of Cancer Therapy	462 (69.4)
Board Certified Gynecologist of Japan Society of Gynecologic Oncology	390 (58.6)
Board Certified Specialist of Japan Society of Gynecologic and Obstetric Endoscopy and Minimally Invasive Therapy	171 (25.7)
Board Certified of Japanese Board of Medical Genetics and Genomics, Clinical Genetics	67 (10.1)
Board Certified healthcare specialist of the Japan Society for Menopause and Women's Health	67 (10.1)
Primarily institutional affiliation (Answer to Q4)	
General hospital other than university hospital/center hospital	306 (45.9)
University hospital	247 (37.1)
Center hospital (including cancer centers)	74 (11.1)
Outpatient office/clinic	32 (4.8)
Gynecology Hospital	4 (0.6)
Company/Governmental institution	1 (0.2)
Location of the institution* (Answer to Q5)	
Tokyo	120 (18.0)
Osaka	59 (8.9)
Fukuoka	46 (6.9)
Kanagawa	44 (6.6)
Aichi	27 (4.1)
Whether or not affiliated institution has an independent clinical genetics department (Answer to Q6)	
Yes	308 (46.2)
Yes, but our department handles clinical genetics	36 (5.4)
No, thus our department handles clinical genetics	107 (16.1)
No, thus we make referrals to external partner facilities	215 (32.3)
How your institution is involved in cancer genome medicine (Answer to Q7)	
We are involved as a designated medical institution of a Cancer Genomic Medicine Core Hospital/Central Hospital/Partner Hospital	362 (54.4)
We make referrals to a Cancer Genomic Medicine Core Hospital/Central Hospital/Partner Hospital	203 (30.5)
We are considering making referrals to a Cancer Genomic Medicine Core Hospital/Central Hospital/Partner Hospital	83 (12.5)
We do not practice or make referrals for genomic medicine, nor have plans to do so	18 (2.7)

*Top 5 are listed.

education opportunities related to HBOC (68.7%), expanded health insurance coverage (58.7%), and improved literacy among the general public (56.1%) to promote HBOC practice (**Fig. 1B**). Most physicians practiced some form of HBOC management, which were as follows (**Fig. 2A**): explanation regarding the HBOC/*BRCA* genetic testing as an attending physician (76.1%), *BRCA* genetic testing as a companion diagnosis for PARP inhibitors (75.8%), use of PARP inhibitors (75.5%), explaining results of *BRCA* genetic testing (65.8%), *BRCA* genetic testing to diagnose HBOC in individuals who have already developed cancer as a part of health insurance-covered care (53.2%), explanation and consultation on HBOC to the family members of patients who have not yet developed cancer (38.0%), surveillance (34.5%), RRSO (health insurance-covered care) for patients who have already developed breast cancer (25.1%), *BRCA* genetic testing to diagnose HBOC in individuals who have not yet developed cancer outside the health insurance coverage (20.3%), and RRSO (outside the health insurance coverage) for patients who have not developed breast cancer (14.1%). In terms of psychological burden (**Fig. 2B**), many respondents did not experience psychological

Table 2. Answers to each question in the questionnaire survey on HBOC practice

Questions	No. (%)
Percentage of effort that can be devoted to HBOC practice in daily clinical setting (Answer to Q8)	
0-5	492 (73.9)
5-10	120 (18.0)
10-15	11 (1.7)
15-20	24 (3.6)
20+	19 (2.9)
When to consider a referral to a certified geneticist (Answer to Q14, multiple selections allowed)	
The patient requests it	489 (73.4)
<i>BRCA</i> genetic testing is found to be a VUS or positive for pathogenic variants	442 (66.4)
<i>BRCA</i> genetic testing is performed as a self-pay to diagnose HBOC in a patient who has not developed cancer	352 (52.9)
<i>BRCA</i> genetic testing is performed as an insurance management to make a diagnosis of HBOC in a patient who has already developed cancer	206 (30.9)
Explaining the results of <i>BRCA</i> genetic testing	189 (28.4)
Explaining about HBOC	165 (24.8)
Conducting <i>BRCA</i> genetic testing as a companion diagnosis to PARP inhibitors	129 (19.4)
Responses regarding whether physicians with no experience in HBOC practice want to be involved in HBOC practice in the future (n = 199) (Answer to Q15)	
Yes	154 (77.4)
No	45 (22.6)
Reasons for not wanting to be involved in HBOC practice among physicians who answered that they did not want to be (n = 67) (Answer to Q15-1, multiple selections allowed)*	
Too busy with daily practice to devote time to HBOC practice	30 (44.8)
Lacking the confidence required to engage in HBOC practice owing to the lack of knowledge about genetic diseases	23 (34.3)
Genetic diseases should be managed at facilities with genetic departments	21 (31.3)
To feel that it is a hereditary disease and a heavy responsibility	17 (25.4)
No medical professionals around who specialize in genetic medicine	14 (20.9)
Lacking cooperation or understanding from other clinical departments	11 (16.4)
Too troublesome to respond to patients	9 (13.4)
Not to feel that patients need it	7 (10.4)
Too troublesome to attend seminars, etc.	4 (6.0)
Responses regarding the intention to apply <i>BRCA</i> genetic testing for the diagnosis of HBOC in patients with previous ovarian cancer (Answer to Q22)	
Strongly agree	275 (41.3)
Somewhat agree	329 (49.4)
Somewhat disagree	59 (8.9)
Strongly disagree	3 (0.5)

HBOC, hereditary breast and ovarian cancer; VUS, variant of uncertain significance; PARP, poly(ADP-ribose) polymerase.

*Top 5 are listed.

burden in HBOC practices related to the use of PARP inhibitors (81.6% of the respondents did not believe that it was a burden) and *BRCA* genetic testing as a companion diagnosis for PARP inhibitors (68.8% of the respondents did not believe that it was a burden). In contrast, physicians experienced a psychological burden when they had to explain and consult about HBOC to the family members of patients who have not yet developed cancer (believed that it was (somewhat of) a burden, 78.2%) and perform *BRCA* genetic testing outside their health insurance coverage to perform diagnosis of HBOC in individuals who have not yet developed cancer (believed that it was (somewhat of) a burden, 76.6%), indicating that there was a psychological burden on gynecologic oncologists while practicing HBOC management in individuals who have not yet developed cancer. Physicians believed that securing sufficient time to engage in HBOC management (69.1%), creating documents and leaflets that aid in providing patients with easy-to-understand explanations (68.5%), collaborating with healthcare professionals specialized in genetic medicine (65.9%), and increasing educational opportunities to improve physician proficiency in HBOC (58.3%) were measures that could be taken to alleviate the psychological burdens of HBOC practice (**Fig. 2C**). The most important time to consider a referral to a certified geneticist was when the patient requested it (73.4%), in addition to when the *BRCA* genetic testing results were found to be a variant of uncertain significance (VUS) or were positive for pathogenic variants (66.4%) (**Table 2**).

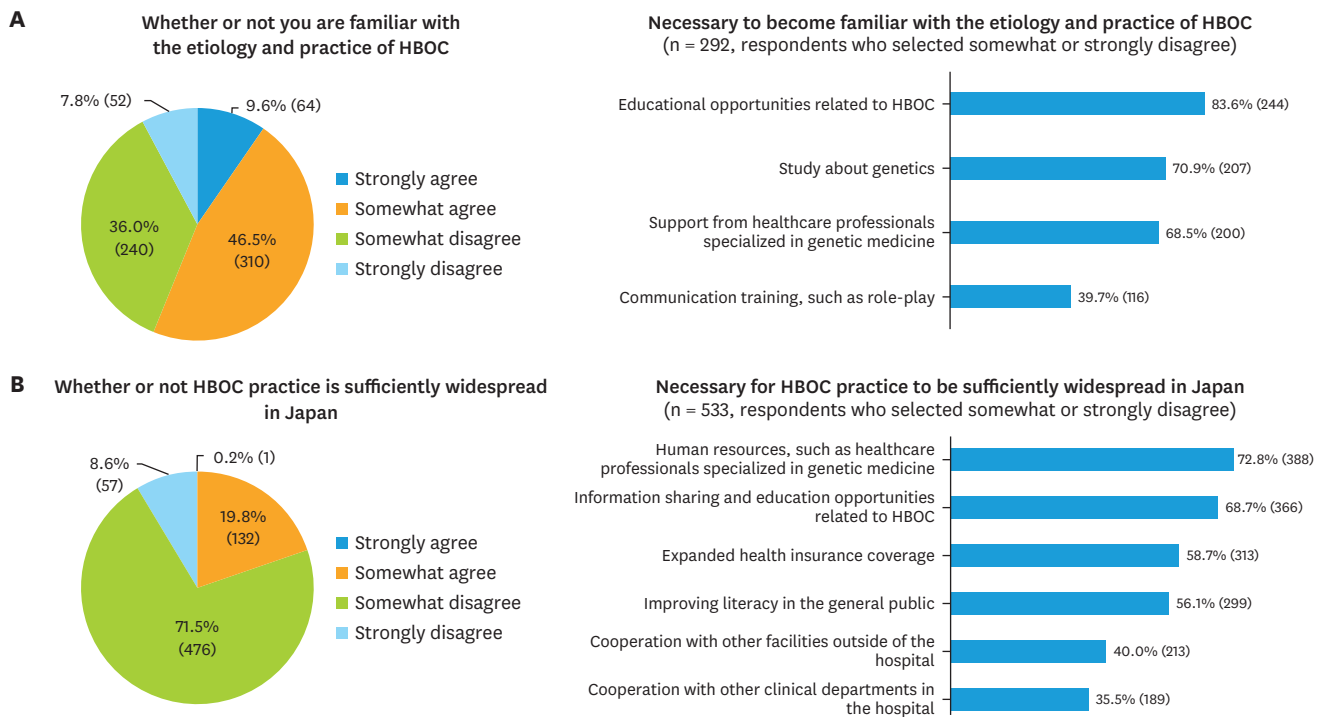


Fig. 1. Respondents' own and Japan's overall perception of HBOC practice. (A) Responses regarding familiarity with the etiology and practice of HBOC (Answer to Q9) (left) and what is required to be familiar (Answer to Q9-1) (right). (B) Responses regarding whether HBOC practice is sufficiently widespread in Japan (Answer to Q10) (left) and what is required to be sufficiently widespread (Answer to Q10-1) (right). HBOC, hereditary breast and ovarian cancer.

Among the respondents who had no experience in HBOC management (n = 199), 77.4% answered that they would like to be involved in HBOC management in the future (**Table 2**). The chief reasons given by those who answered that they would not want to be involved (n = 67) were that they were too busy with their daily practice to devote time to HBOC practice (44.8%), that they lacked the confidence required to engage in HBOC practice owing to the lack of knowledge about genetic diseases (34.3%), and that they believed that genetic diseases should be managed at facilities with genetic departments (31.3%) (**Table 2**).

3. Insurance coverage for HBOC management

HBOC management was previously a completely out-of-pocket expense for individuals in Japan until April 2020, when insurance coverage was expanded to cover specific portions of HBOC management. The majority of respondents (84.2%) understood the contents of the insurance coverage (understand very well, 36.8%; understand somewhat, 47.4%) (**Fig. 3A**). The majority of the respondents (79.3%) answered that the expanded insurance coverage would affect their daily practice (strongly agree, 32.6%; somewhat agree, 46.7%) because options for HBOC management in a clinical setting have increased (74.8%) and because physicians would be required to study about HBOC practice as basic knowledge (42.6%) (**Fig. 3B**). Only 51.2% (5.0% strongly agree, 46.2% somewhat agree) of the respondents answered in the affirmative about whether HBOC management has become a common practice owing to insurance coverage, suggesting that it is not yet a part of common clinical practice. Possible reasons why HBOC management has not become a common practice were because patients were not familiar with HBOC practice (71.7%), the number of healthcare professionals who could provide HBOC management was not yet adequate (64.0%), and because some patients were not eligible for care, such as individuals who have not developed cancer (58.2%) (**Fig. 3C**). In contrast, a

Current Status of HBOC Practice in Japan

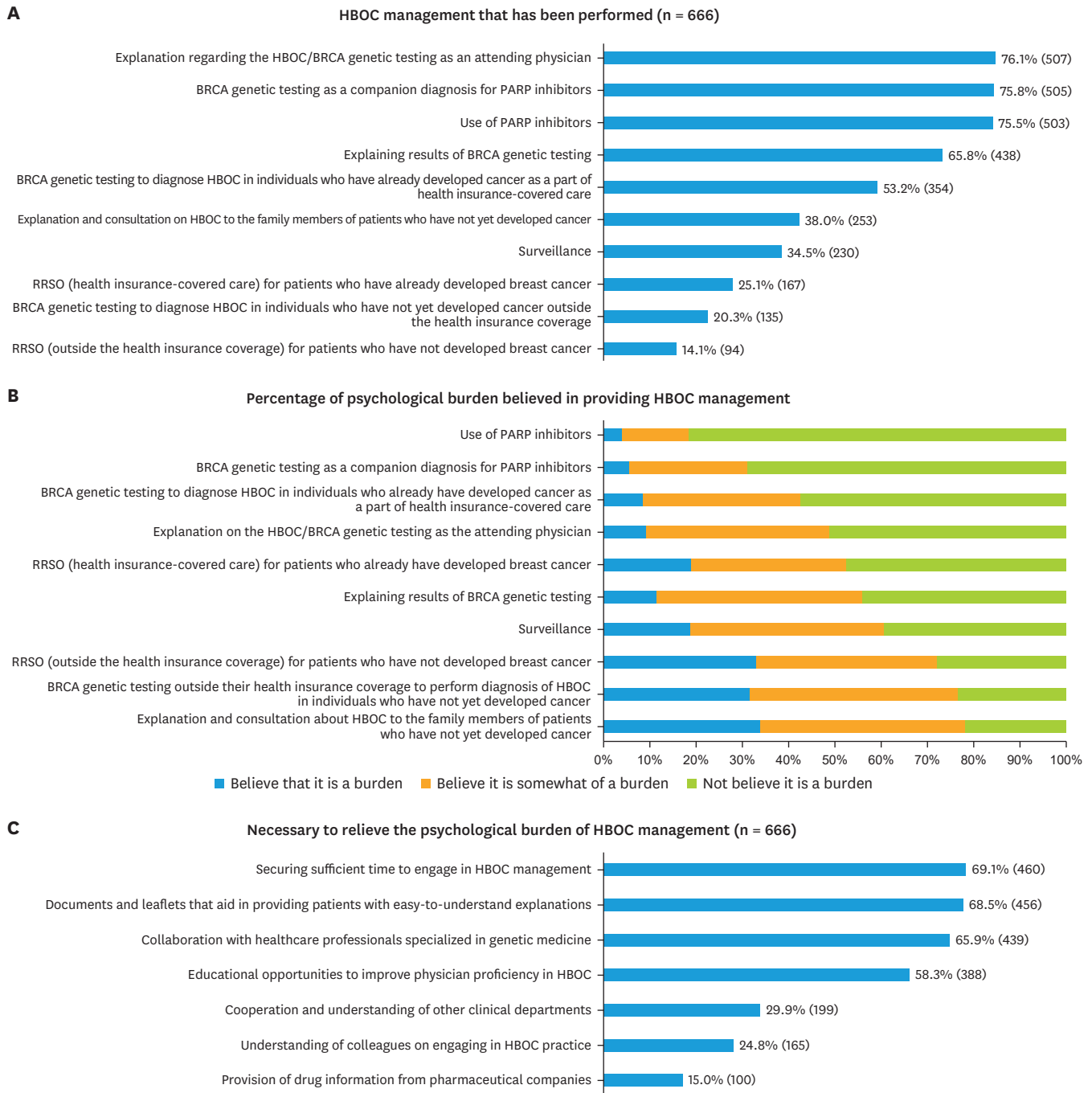
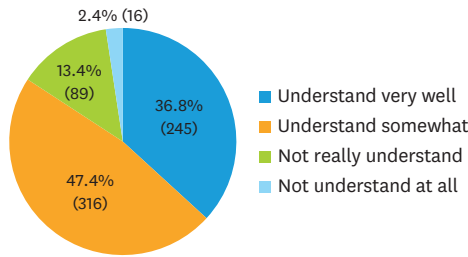


Fig. 2. Experience in HBOC management, details of the psychological burden involved, and what is necessary to remove the burden. (A) Actual experience in HBOC management (Answer to Q11). (B) Responses regarding the psychological burden in providing HBOC management (Answer to Q12). (C) Necessary to relieve the psychological burden in providing HBOC management (answer to Q13). HBOC, hereditary breast and ovarian cancer; PARP, poly(ADP-ribose) polymerase; RRSO, risk-reducing salpingo-oophorectomy.

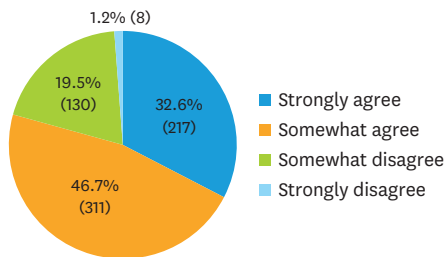
majority of the respondents (91.8%) (strongly agree, 21.8%; somewhat agree, 70.0%) answered in the positive that HBOC practice would become more widespread as a result of the increased insurance coverage, suggesting that the advancement of HBOC practice so far has been limited owing to economic barriers (Fig. 3D). The majority of respondents (90.7%) answered in the affirmative (strongly agree, 41.3%; somewhat agree, 49.4%) as to whether they would actively

Current Status of HBOC Practice in Japan

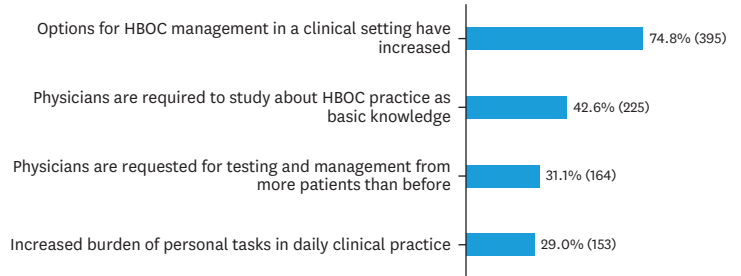
A Whether or not physicians understand which specific examinations or managements are now covered under health insurance



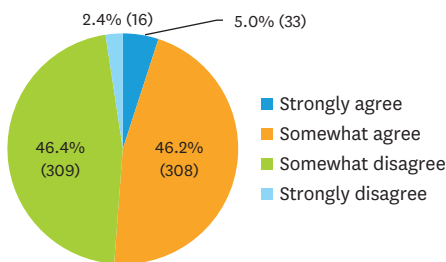
B Whether or not physicians feel that expanded insurance coverage would affect their daily clinical practice



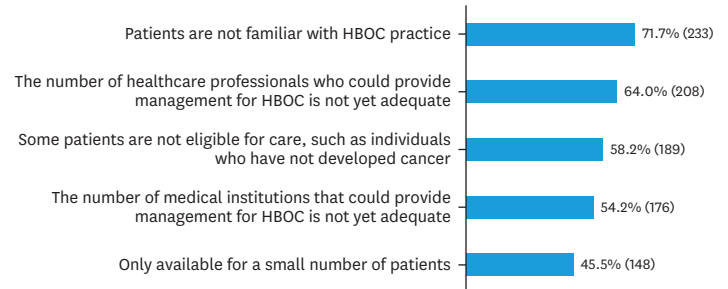
Reasons for feeling affected
(n = 528, respondents who selected somewhat or strongly agree)



C Whether or not HBOC management has become a common practice owing to insurance coverage



Reasons why HBOC management has not become a common practice
(n = 325, respondents who selected somewhat or strongly disagree)



D Whether or not HBOC practice will become more widespread in the future owing to insurance coverage

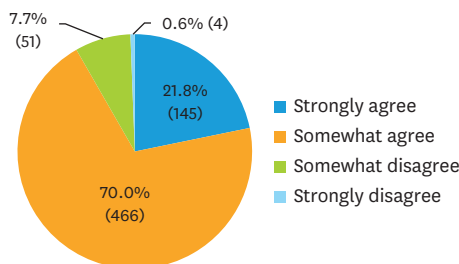


Fig. 3. Current understanding of the insurance coverage of a part of HBOC practice and its impact on the daily clinical practice. (A) Current understanding of HBOC practice covered by health insurance (Answer to Q16). (B) Responses to whether daily clinical practice has been affected by the insurance coverage (left) and reasons for feeling so (right) (Answers to Q17 and Q17-1). (C) Responses to whether HBOC practice has become a common practice owing to insurance coverage (left) and reasons for not believing so (right) (Answers to Q18 and Q18-1). (D) Responses to whether HBOC practice will become more widespread in the future owing to insurance coverage (Answer to Q19). HBOC, hereditary breast and ovarian cancer.

apply *BRCA* genetic testing for the diagnosis of HBOC in patients with previous ovarian cancer in the future (Table 2).

4. Educational opportunities related to HBOC

Approximately 67.9% of the respondents felt that the educational opportunities they had received were insufficient (Fig. 4A), whereas 79.4% of the respondents had attended a seminar related to HBOC practice (Fig. 4B), and they desired to receive future educational opportunities to expand their knowledge base, such as academic society-led educational material, e-learning and online seminars (82.6%), and sessions related to HBOC in academic society meetings (68.9%), and sessions related to HBOC in academic society meetings (68.9%) (Fig. 4C).

DISCUSSION

The landscape of HBOC practice in Japan is changing rapidly. PARP inhibitors were approved for the treatment of ovarian cancer in 2018, but the indication for their use has now been expanded to include breast, pancreatic, and prostate cancers. Furthermore, the implementation of companion diagnostics has increased the chances of diagnosis and managing HBOC in Japan. The number of HBOC management practices is also expected to increase following the expanded coverage of some of these management practices from April 2020. However, as this survey revealed, HBOC practice has not reached the level of general practice in Japan at present, and to achieve a more widespread HBOC practice in Japan, it is essential to actively effect change in three aspects: human resources for practices, educational opportunities for physicians, and the continued expansion of insurance coverage to those patients who have not yet developed cancer.

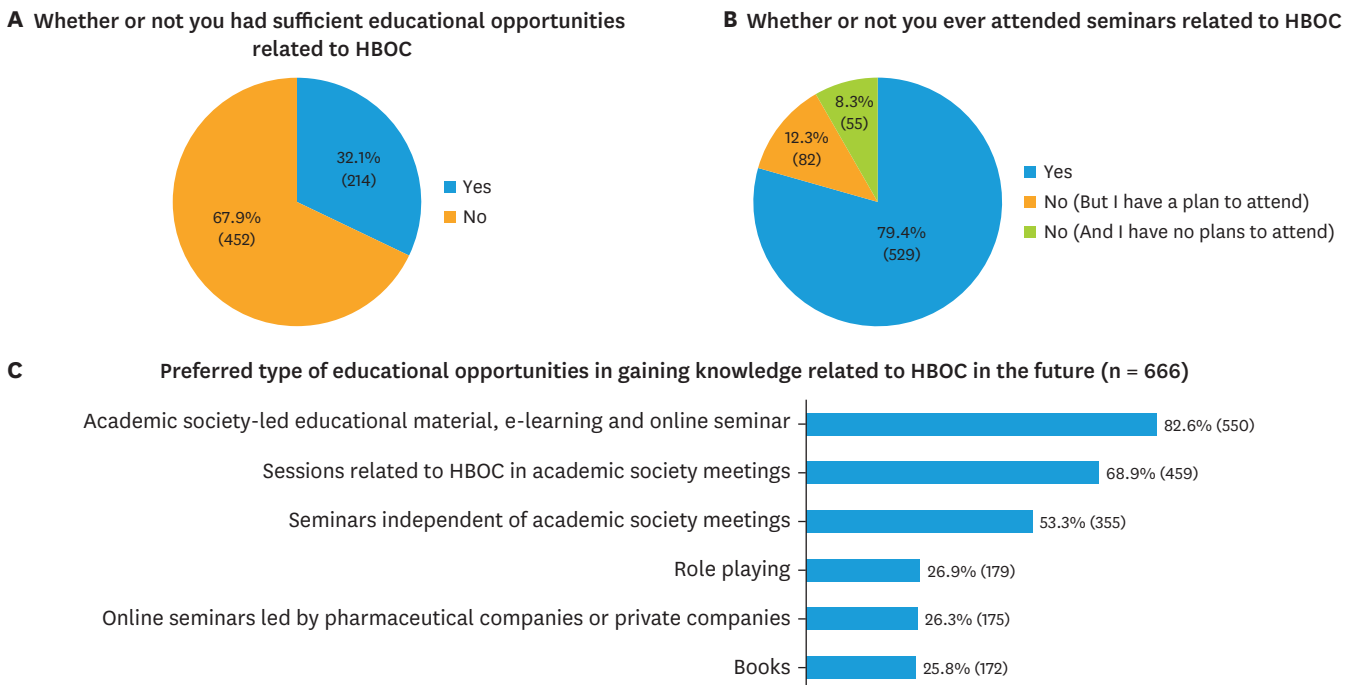


Fig. 4. The current status and future needs of educational opportunities related to HBOC. (A) Responses regarding previous educational opportunities related to HBOC (Answer to Q23). (B) Responses regarding previous seminars related to HBOC (Answer to Q24). (C) Responses regarding preferred educational opportunities in gaining knowledge related to HBOC (Answer to Q25). HBOC, hereditary breast and ovarian cancer.

First, there should be an increased focus on collaboration with genetic counselors as a way of expanding human resources. In Japan, genetic counseling is regarded a medical procedure, and it is conducted in many institutions by doctors in the department or by doctors in charge of genetic counseling. In the United States, in contrast, professional genetic counselors take the lead in genetic counseling, whereas doctors are responsible for diagnosis and management, clearly defining the roles of each professional [7]. In recent years, the Japanese Society for Genetic Counseling and the Japan Society of Human Genetics have jointly established a system of certified genetic counselors [8]. The fact that certified genetic counselors are gradually participating in medical practice is a noteworthy change; however, the number of certified genetic counselors remains insufficient, and it is hoped that the number of certified genetic counselors will increase. There is also a need to correct the geographic disparities between genetic professionals, and remote (telephone and web-based) genetic counseling will likely help to ameliorate this imbalance. In fact, in the USA, genetic counseling via telephone is gaining popularity [9,10]. A randomized controlled study comparing telephone and face-to-face methods of providing genetic counseling demonstrated equal efficacy [11,12]. Telephone counseling is less psychologically demanding than in-person counseling, and it may motivate more patients to seek counseling if introduced in Japan. However, patients who received genetic counseling by telephone were less likely to undergo genetic testing than patients who were counseled in-person [11,12]. This concern may be allayed with increased web- and internet-based consultations that are likely to increase in the future [13].

The American Society of Clinical Oncology recommended continued education of oncologists and other healthcare professionals in the field of cancer risk assessment and management of individuals with an inherited predisposition to cancer [14]. In Japan, medical students receive few lectures on genetics, and gynecologic oncologists and breast surgeons have only begun to attend society-led seminars so as to learn the fundamentals of clinical genetics and oncogenetics required to diagnose and treat HBOC, although the Guidelines for Diagnosis and Treatment of Hereditary Breast and Ovarian Cancer 2021 published by the Japanese Organization of Hereditary Breast and Ovarian Cancer is extremely useful for these physicians. Therefore, it is imperative that changes in medical education are instituted early; physicians training to treat patients with cancer should be taught the principles of oncogenetics earlier in their careers. This will establish an infrastructure within which HBOC practice can flourish. Furthermore, expanding the educational content led by the relevant societies is essential for developing quality continuing medical education initiatives. It is a welcome trend that the JSGO is discussing the requirement of genetic training as part of the training meant for board-certificated gynecologic oncologists.

In South Korea, *BRCA* gene testing is supported by the National Health Insurance if the patient has a risk of HBOC. If the patient has been proven to have a *BRCA* variant, RRSO and genetic testing of family members are also supported [15]. As a result, the rate of RRSO implementation in South Korea had recently increased to 52.4% [16]. In the United States, the Patient Protection and Affordable Care Act (ACA) of 2014 requires that women with a family history of HBOC or suspected cancer be offered genetic counseling and testing for *BRCA* free of cost, as long as they are not currently being treated for cancer [17]. *BRCA* genetic testing for men and women currently being treated for cancer is not covered under the ACA, but most private health insurance companies provide coverage to patients with suspected HBOC [18]. The definition of HBOC in the Japanese Guidelines for Diagnosis and Treatment of Hereditary Breast and Ovarian Cancer 2021 is “a susceptibility syndrome of

cancer caused by a germline pathogenic variant of *BRCA1/2*,” and because both patients who have not yet developed cancer and those who have already developed cancer are HBOC, it is urgent that HBOC management for patients who have not yet developed cancer be covered by insurance. To expand the coverage of HBOC in Japan in the future, legislation and efforts by the government and private insurance companies are required. Actively conducting clinical research on HBOC in Japan is also crucial to understand the efficacy and safety of HBOC practice for patients in Japan. The cost-effectiveness of HBOC management should be given more consideration [19], and clinical trials are required to understand the clinical and genetic characteristics of *BRCA* variant carriers in Japan. Data from the national registry of *BRCA* genetic test-takers can be utilized in these studies.

In conclusion, this survey revealed that gynecologic oncologists in Japan experience HBOC practice in the context of the widespread use of PARP inhibitors and their companion diagnostics. Most physicians feel psychologically burdened when it comes to the management of HBOC. Although the HBOC practice is expected to become more widespread now that some of the management approaches are covered by insurance, it has not reached the level of general practice at present. To equalize and promote HBOC practice in the future, there is a need to expand the practice infrastructure, including strengthening human resources and physician- and patient-centered educational content, as well as to re-examine the items covered by insurance.

ACKNOWLEDGEMENTS

The authors would like to acknowledge all JSGO members who responded to this survey and thank to Dr. Takayuki Takahashi for creating a questionnaire form.

SUPPLEMENTARY MATERIAL

Data S1

Survey on current practice in hereditary breast and ovarian cancer provided by gynecologic oncologists

[Click here to view](#)

REFERENCES

1. Momozawa Y, Iwasaki Y, Parsons MT, Kamatani Y, Takahashi A, Tamura C, et al. Germline pathogenic variants of 11 breast cancer genes in 7,051 Japanese patients and 11,241 controls. *Nat Commun* 2018;9:4083.
[PUBMED](#) | [CROSSREF](#)
2. Hirasawa A, Imoto I, Naruto T, Akahane T, Yamagami W, Nomura H, et al. Prevalence of pathogenic germline variants detected by multigene sequencing in unselected Japanese patients with ovarian cancer. *Oncotarget* 2017;8:112258-67.
[PUBMED](#) | [CROSSREF](#)
3. Enomoto T, Aoki D, Hattori K, Jinushi M, Kigawa J, Takeshima N, et al. The first Japanese nationwide multicenter study of *BRCA* mutation testing in ovarian cancer: CHARACTERizing the cross-sectional approach to Ovarian cancer geneTic TESting of *BRCA* (CHARLOTTE). *Int J Gynecol Cancer* 2019;29:1043-9.
[PUBMED](#) | [CROSSREF](#)

4. Kuchenbaecker KB, Hopper JL, Barnes DR, Phillips KA, Mooij TM, Roos-Blom MJ, et al. Risks of breast, ovarian, and contralateral breast cancer for *BRCA1* and *BRCA2* mutation carriers. *JAMA* 2017;317:2402-16.
[PUBMED](#) | [CROSSREF](#)
5. Siegel RL, Miller KD, Fuchs HE, Jemal A. Cancer statistics, 2021. *CA Cancer J Clin* 2021;71:7-33.
[PUBMED](#) | [CROSSREF](#)
6. Torre LA, Trabert B, DeSantis CE, Miller KD, Samimi G, Runowicz CD, et al. Ovarian cancer statistics, 2018. *CA Cancer J Clin* 2018;68:284-96.
[PUBMED](#) | [CROSSREF](#)
7. Berliner JL, Cummings SA, Boldt Burnett B, Ricker CN. Risk assessment and genetic counseling for hereditary breast and ovarian cancer syndromes-practice resource of the National Society of Genetic Counselors. *J Genet Couns* 2021;30:342-60.
[PUBMED](#) | [CROSSREF](#)
8. Aizawa Y, Watanabe A, Kato K. Institutional and social issues surrounding genetic counselors in Japan: current challenges and implications for the global community. *Front Genet* 2021;12:646177.
[PUBMED](#) | [CROSSREF](#)
9. Buchanan AH, Rahm AK, Williams JL. Alternate service delivery models in cancer genetic counseling: a mini-review. *Front Oncol* 2016;6:120.
[PUBMED](#) | [CROSSREF](#)
10. Stoll K, Kubendran S, Cohen SA. The past, present and future of service delivery in genetic counseling: keeping up in the era of precision medicine. *Am J Med Genet C Semin Med Genet* 2018;178:24-37.
[PUBMED](#) | [CROSSREF](#)
11. Schwartz MD, Valdimarsdottir HB, Peshkin BN, Mandelblatt J, Nusbaum R, Huang AT, et al. Randomized noninferiority trial of telephone versus in-person genetic counseling for hereditary breast and ovarian cancer. *J Clin Oncol* 2014;32:618-26.
[PUBMED](#) | [CROSSREF](#)
12. Kinney AY, Butler KM, Schwartz MD, Mandelblatt JS, Boucher KM, Pappas LM, et al. Expanding access to *BRCA1/2* genetic counseling with telephone delivery: a cluster randomized trial. *J Natl Cancer Inst* 2014;106:dju328.
[PUBMED](#) | [CROSSREF](#)
13. Lee R, Frick M, Joseph G, Guerra C, Stewart S, Kaplan C, et al. Research to reduce inequities in cancer risk services: insights for remote genetic counseling in a pandemic and beyond. *J Genet Couns* 2021;30:1292-7.
[PUBMED](#) | [CROSSREF](#)
14. Robson ME, Bradbury AR, Arun B, Domchek SM, Ford JM, Hampel HL, et al. American Society of Clinical Oncology policy statement update: genetic and genomic testing for cancer susceptibility. *J Clin Oncol* 2015;33:3660-7.
[PUBMED](#) | [CROSSREF](#)
15. Lee J, Kim S, Kang E, Park S, Kim Z, Lee MH, et al. Influence of the Angelina Jolie announcement and insurance reimbursement on practice patterns for hereditary breast cancer. *J Breast Cancer* 2017;20:203-7.
[PUBMED](#) | [CROSSREF](#)
16. Kim SI, Lim MC, Lee DO, Kong SY, Seo SS, Kang S, et al. Uptake of risk-reducing salpingo-oophorectomy among female *BRCA* mutation carriers: experience at the National Cancer Center of Korea. *J Cancer Res Clin Oncol* 2016;142:333-40.
[PUBMED](#) | [CROSSREF](#)
17. Walcott FL, Dunn BK. Legislation in the genomic era: the Affordable Care Act and genetic testing for cancer risk assessment. *Genet Med* 2015;17:962-4.
[PUBMED](#) | [CROSSREF](#)
18. FORCE-Facing Our Risk of Cancer Empowered. Tampa, FL: FORCE; c2022 [cited 2022 Apr 1]. Available from: <https://www.facingourrisk.org/>.
19. Yamauchi H, Nakagawa C, Kobayashi M, Kobayashi Y, Mano T, Nakamura S, et al. Cost-effectiveness of surveillance and prevention strategies in *BRCA1/2* mutation carriers. *Breast Cancer* 2018;25:141-50.
[PUBMED](#) | [CROSSREF](#)