original reports

Survey of Fertility Preservation Options Available to Patients With Cancer Around the Globe

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abstract

PURPOSE Oncofertility focuses on providing fertility and endocrine-sparing options to patients who undergo life-preserving but gonadotoxic cancer treatment. The resources needed to meet patient demand often are fragmented along disciplinary lines. We quantify assets and gaps in oncofertility care on a global scale.

METHODS Survey-based questionnaires were provided to 191 members of the Oncofertility Consortium Global Partners Network, a National Institutes of Health–funded organization. Responses were analyzed to measure trends and regional subtleties about patient oncofertility experiences and to analyze barriers to care at sites that provide oncofertility services.

RESULTS Sixty-three responses were received (response rate, 25%), and 40 were analyzed from oncofertility centers in 28 countries. Thirty of 40 survey results (75%) showed that formal referral processes and psychological care are provided to patients at the majority of sites. Fourteen of 23 respondents (61%) stated that some fertility preservation services are not offered because of cultural and legal barriers. The growth of oncofertility and its capacity to improve the lives of cancer survivors around the globe relies on concentrated efforts to increase awareness, promote collaboration, share best practices, and advocate for research funding.

CONCLUSION This survey reveals global and regional successes and challenges and provides insight into what is needed to advance the field and make the discussion of fertility preservation and endocrine health a standard component of the cancer treatment plan. As the field of oncofertility continues to develop around the globe, regular assessment of both international and regional barriers to quality care must continue to guide process improvements.

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INTRODUCTION

The primary goal of oncofertility is to increase access for patients with cancer to fertility counseling and fertility preservation options to improve the overall quality of life of cancer survivors.[1,2] As the field of oncofertility expands, a need exists to clarify the oncofertility services that are provided on a global scale and to define the challenges faced by providers and patients. Current barriers represent areas for improvement in this growing field and can be addressed through collaboration with professional societies and governments. For these reasons, we conducted a global oncofertility resource assessment survey to document the experiences of existing oncofertility centers within the Oncofertility Consortium (OC) Global Partners Network.

METHODS

Survey Design

A survey was sent to members of the OC Global Partners Network and international experts in the field to collect information about the fertility preservation services offered to patients with cancer and the barriers to oncofertility care at their centers. The survey was written in English because all potential participants were English speaking. Invited study participants were clinicians, researchers, nurses, patient navigators, and psychologists. A pilot survey was generated for attendees of the 2015 Oncofertility Conference and after cognitive debriefing, was subsequently converted to an electronic format through the use of SurveyMonkey software. The final version

ASSOCIATED CONTENT

Appendix

Author affiliations and support information (if applicable) appear at the end of this article.

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was e-mailed to 191 contacts of the OC Global Partners Network. The Northwestern University institutional review board determined that the study did not constitute research that involves human subjects; therefore, additional institutional review board review and approval was not required.

Survey Inclusion/Exclusion

Upon receipt of multiple responses from the same center, scores were averaged to generate mean values. All open-ended response data provided by the study participants are reported in the results. Surveys were excluded from the analysis if respondents did not provide contact or identification information, if the survey was left blank, or if duplicate responses were submitted. Appendix Table A1 lists the countries and organizations that participated in the study.

Survey Questions

Respondents were asked a total of 12 questions about organization of referrals, patient access to medical professionals, barriers and challenges faced at centers, and estimated reimbursement of oncologic fertility preservation by governmental entities or insurance companies (Appendix Table A2). Six questions were dichotomous (yes/no), with space provided for open-ended comments (questions 1, 2, 3, 6, 10, and 11). Three questions were multiple choice, where only one answer could be selected (questions 7, 8, and 9). Two questions were multiple response where respondents could select one or more answers (questions 5 and 12). One question contained a matrix of drop-down menus where respondents could select whether a fertility preservation service is offered to specific age ranges of female and male patients (question 4).

Analysis of Survey Results

Survey responses were exported to Microsoft Excel software (Microsoft Corporation, Redmond, WA). The dichotomous and multiple response questions were coded with numerical values (yes = 1, no = 2) to facilitate statistical analysis. Graphs were generated with both SPSS for Windows version 23.0 (IBM Corporation, Armonk, NY) and Microsoft Excel software. Descriptive statistics were used to analyze the quantitative data. Two individuals who were blinded to the region analyzed written responses.

RESULTS

A total of 63 responses were received (response rate, 25%), and of those, 47 were valid, which resulted in the inclusion of 40 centers after combining multiple responses from the same center. Appendix Table A1 lists the participating centers by country and continent. Appendix Table A3 lists the frequencies and percentages of responses to dichotomous (yes/no) questions. The denominator for each survey question changed according to the number of responses because not all respondents opted to answer each question.

Organization of Referrals

In terms of organizational structure, 30 of 40 respondents (75%) reported having an established referral system at their site, and 35 of 40 (88%) reported having a patient registry. The largest group of respondents, 14 of 37 (38%), indicated that the average length of time at their center between cancer diagnosis and fertility preservation consultation is 1 to 2 days. Nine of 37 respondents (24%) reported that the time between consultation and fertility preservation procedures was 1 to 2 days; nine of 37 (24%) also reported the time to be 3 to 5 days between consultation and fertility preservation procedures. Eleven of 36 (31%) indicated the time between fertility preservation and cancer treatment was 3 to 5 days. (Appendix Table A4).

Respondents reported a variety of referral processes. Some centers see patients with cancer for fertility preservation counseling within 24 hours of diagnosis, such as at the IVF Centro de Reproducción in Panama and at the Seoul National University Bundang Hospital in South Korea; two sites specified that the referral from cancer diagnosis to fertility consultation can take $\geq$ 3 weeks.

As indicated in the open-ended survey responses, oncologists refer their patients at the majority of centers (16 of 19). However, at the Centro de Preservação da Fertilidade in Portugal, Huntington Medicina Reprodutiva in Brazil, and McGill University Health Centre Reproductive Centre in Canada, patients may set up their own appointments. The Seoul National University Bundang Hospital attributed referral challenges to discrepancies between the policies that govern oncologists and reproductive physicians. At the Royal Children's Hospital in Melbourne, Australia, the development of written informational support, clear referral pathways, and fertility preservation management protocols within the pediatric setting have doubled the rate of fertility counseling since 2013. The Clinic of Endocrinological Gynecology at the Jagiellonian University Medical College in Poland noted time burden and a lack of awareness among clinicians as its two greatest barriers to care.

Patient Access to Specialized Professionals

Nine of 34 respondents (26%) reported having a nurse navigator, social worker, or specific oncofertility patient navigator for patients with cancer of reproductive age. At the Ceará Blood Center in Fortaleza, Brazil, an oncology nurse navigator (a registered nurse with oncology-specific knowledge) offers individualized assistance to patients and their families. This patient navigator provides the education and resources necessary to expedite stressful decision making for the patient and ensures timely access to quality health and psychosocial care.

With regard to patient counseling, 30 of 40 respondents (75%) provide routine psychological support to patients.

At the Centre for Fertility Preservation at the Coimbra Hospital and University Centre in Portugal, a psychologist specializes in helping patients through fertility preservation decision making after a cancer diagnosis. If the patient ultimately decides to undergo a procedure, the psychologist provides support throughout the entirety of the fertility preservation process by gauging the patient's mental condition and emotional state.

Services Offered at the Initial Fertility Preservation Consultation

Thirty seven of 40 survey respondents (93%) identified the services offered to patients at their facilities. For pediatric males and females, the services most commonly offered are testicular tissue cryopreservation (n = 16) and ovarian tissue cryopreservation (n = 26), respectively. For adolescent males and females, sperm cryopreservation (n = 34) and egg cryopreservation (n = 26) and ovarian tissue cryopreservation (n = 28) are available options. In the adult age category, more third-party options were discussed with both males and females, including adoption (n = 29) and donation of eggs (n = 23), sperm (n = 25), and embryos (n = 28). Of the 40 respondents, only one stated that gestational surrogacy is mentioned as a future possible consideration to pediatric females; six reported mentioning gestational surrogacy to adolescent females, and 18 reported mentioning the option to adult females (Fig 1).

Barriers and Challenges

The majority of respondents, 37 of 40 (93%), identified barriers to care (Table 1). Fourteen of 23 respondents

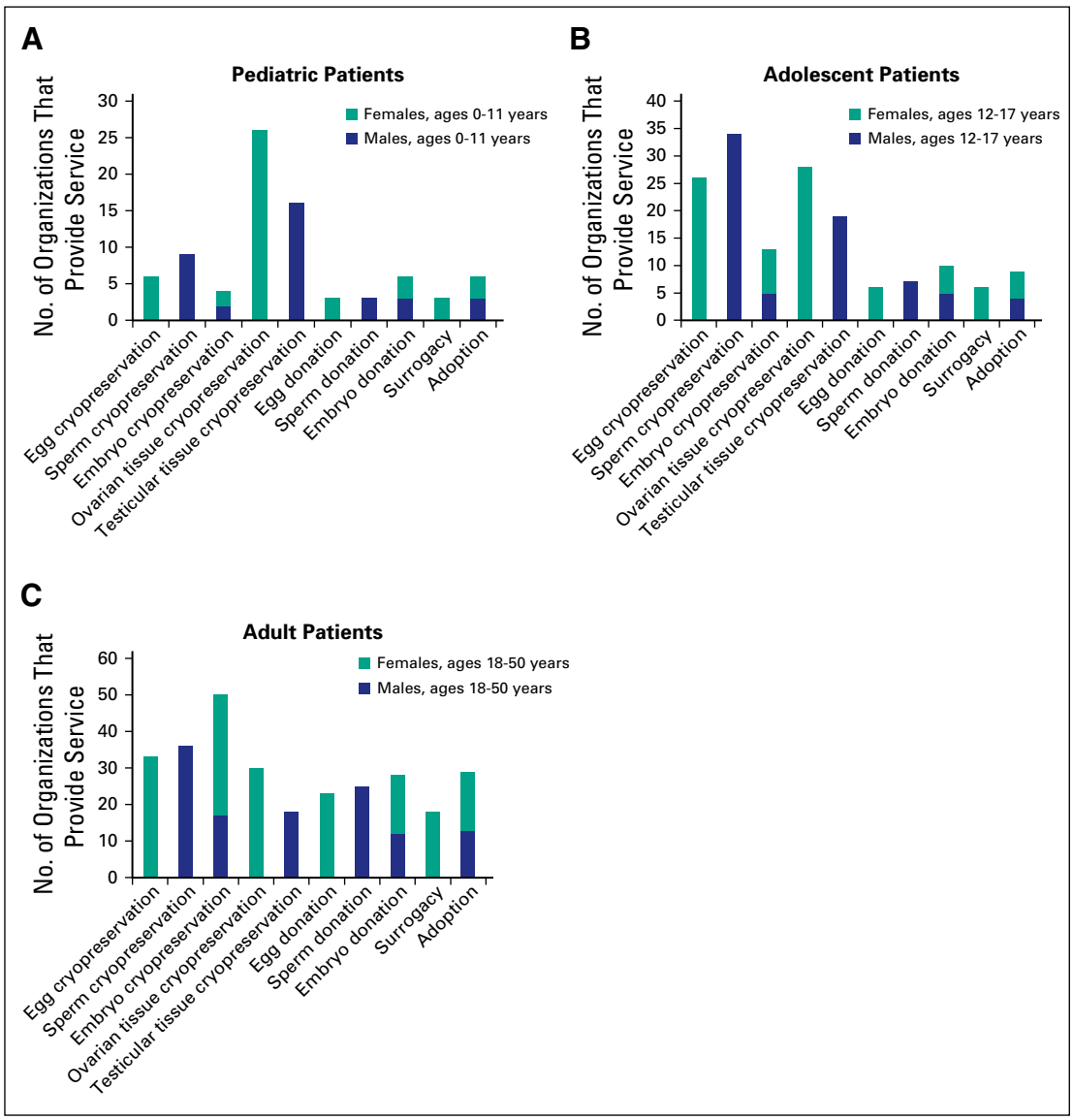

FIG 1. Fertility preservation services offered to patients at survey respondent organizations. (A) Pediatric patients. (B) Adolescent patients. (C) Adult patients.

TABLE 1. Barriers to Care in Countries Included in Study as Indicated by Respondent Organizations

	Barrier									
Continent and Country	Lack of Insurance	Financial Burden to Patient	Issues With Referrals	Lack of Providers	Cultural or Religious Barriers	Dissemination	Inability to Secure Funding for Research/ Clinic	Lack of Donated Tissue	Legal Restrictions	Lack of Institutional Support
Africa										
Egypt	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Tunisia	✓	✓			✓[a]		✓			
Asia										
China	✓		✓	✓			✓	✓	✓	
India	✓	✓	✓					✓		
Iran (Islamic Republic of)	✓	✓	✓		✓			✓[b]		
Japan	✓	✓		✓[c]		✓			✓	✓
Korea (Republic of)	✓	✓	✓				✓	✓		
Turkey	✓		✓					✓	✓	
Europe										
Austria	✓	✓								
Belgium[d]	✓	✓	✓							
Denmark								✓	✓	
France							✓	✓		
Germany			✓			✓		✓	✓	
Poland[e]	✓	✓	✓		✓	✓		✓	✓	
Portugal	✓	✓	✓	✓		✓	✓		✓	
Netherlands			✓			✓	✓	✓		
Russian Federation	✓	✓	✓	✓						
Spain							✓	✓		✓
United Kingdom of Great Britain and Northern Ireland	✓	✓					✓			
North America										
Canada			✓	✓		✓				
Mexico	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Panama			✓		✓	✓				
United States	✓	✓								
Oceania										
Australia[f]	✓	✓	✓				✓	✓		

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TABLE 1. Barriers to Care in Countries Included in Study as Indicated by Respondent Organizations (Continued)

	Barrier									
Continent and Country	Lack of Insurance	Financial Burden to Patient	Issues With Referrals	Lack of Providers	Cultural or Religious Barriers	Dissemination	Inability to Secure Funding for Research/ Clinic	Lack of Donated Tissue	Legal Restrictions	Lack of Institutional Support
South America										
Argentina			✓			✓				
Brazil[g]	✓	✓	✓	✓	✓[h]	✓	✓	✓[i]	✓	
Chile	✓	✓	✓	✓			✓			✓
Peru	✓	✓	✓	✓[i]		✓		✓		

[a]Fear of unmarried women to lose their virginity after transvaginal procedures, such as oocyte pickup.[3]

[b]Especially ovarian and testicular tissue samples from the pediatric population.

[c]Especially more psychologists and nurses are needed.

[d]Small patient population for research.

[e]Little awareness among both physicians and patients of specialized fertility preservation methods.

[f]Lack of protocols for ovarian and testicular tissue cryopreservation in prepubertal children, lack of funding for a clinical oncofertility coordinator, and time burden on clinicians.

[g]Oncologist resistance.

[h]Cultural barriers to sperm donation and laws that do not permit donor payment.

[i]Lack of testicular tissue donation.

[j]Ovarian tissue cryopreservation is currently only offered in a couple of centers, and only a couple of preservations have been performed thus far, whereas oocyte and embryo cryopreservation are routinely offered.

(61%) identified religious or cultural restrictions to oncofertility care offered at their sites. However, lack of insurance coverage and significant financial burden to patients were identified most often (both 62%; 23 of 37).

In addition, 9 of 37 respondents (24%) indicated a lack of providers as a challenge their center faces. In Brazil, physicians' resistance to discuss fertility issues may be one of the greatest challenges, above even the high estimated costs noted (Table 2).

Eleven of 37 respondents (30%) stated that the costs of fertility preservation procedures are covered by insurance or national or provincial health systems, whereas 26 of 37 respondents, more than two thirds (70%), reported that costs are not covered (Appendix Table A3). The highest costs of oncofertility care were noted in Japan. In Gifu, oncofertility procedure costs were reported to be as high as 5,000 US dollars (USD) per patient for ovarian tissue cryopreservation, with sperm cryopreservation costing only approximately 150 USD and egg and embryo cryopreservation costing from 2,500 to 3,500 USD per patient. Respondents from St Mariana University in Kawasaki reported even higher costs for oncofertility procedures, which range from 6,000 to 8,000 USD. In contrast, at the Radboud University Medical Center in the Netherlands, all fertility preservation options are reimbursed by insurance or the hospital (Table 2).

The survey responses indicated various legal challenges about specific procedures. One notable cultural and legal barrier to oncofertility care was related to the use of surrogacy. This topic is explored in the accompanying article.[4]

DISCUSSION

In this study, we found global trends in the services offered to pediatric, adolescent, and young adult patients with cancer, including some notable regional differences, and learned more about challenges and barriers to care. The information gathered in this analysis would be stronger with a higher response rate and a field-wide study population. The OC Global Partners Network was recently founded in 2013, so the survey respondents were limited to the current members of the group at the time of this study. This cohort of professionals was selected because of their declared commitment to the field of oncofertility and ease of contact. However, it is important to recognize that those surveyed are considered leaders in oncofertility care, and as a result, the findings may highlight the most successful settings. An online survey and the existence of language barriers could have contributed to the relatively low response rate, although the response rate is comparable to other clinical surveys.[5]

An oncofertility consult ideally occurs in the short window of time between a cancer diagnosis and the start of treatment. A major goal of the field is for this conversation to become routine practice in cancer treatment.[6] Timely referral of a patient with a new diagnosis by an oncologist to a reproductive endocrinologist is vital and requires an effective connection between the two medical specialists. Studies show that fewer than one half of reproductive-age patients who undergo cancer treatment are referred to endocrinology specialists despite recommendations from ASCO;[7] this is due to a combination of factors, including a lack of knowledge among oncologists, a hesitance of patients to bring up their desire to preserve their fertility, and the inability to delay treatment of aggressive cancers.[8] As a result of these obstacles, patient navigators[9] and established referral processes are critical to ensure patients receive the best and most efficient fertility preservation care possible. The current results are consistent with this observed disconnect, with only one quarter of survey respondents reporting the use of specialized oncofertility navigators.

In addition, national registries are ideal for collecting population data, which can be useful for evaluating the success of fertility preservation referrals. The majority of centers included in this study confirmed that they have established oncofertility registries. In 2015, the Fertility Understanding Through Registry and Evaluation (FUTURE) research group launched the first Web- and population-based national oncofertility registry in Australia and New Zealand.[10] These databases track patient-specific information, including demographic details, cancer stage, and fertility-related issues as a result of cancer or its treatment.[11] FUTURE is expected to be a leading model for other countries to highlight their own systems' assets as well as to identify their unmet needs.

The American Society for Reproductive Medicine and ASCO recommend that psychological counseling be offered before cancer treatment.[12,13] Ready access to a psychologist during the fertility preservation counseling process has been shown to help to reduce patient anxiety as well as enhance communication between relevant medical professionals because the patient's individual needs are more readily identified.[14] Moreover, a marked reduction in anxiety and depression is seen in patients who receive structured cognitive behavioral counseling.[15] Specialized counseling is associated with higher quality-of-life indications and less regret.[1] The fact that 30 of 40 (75%) of the oncofertility centers surveyed provide formal psychological counseling to patients with cancer is encouraging.

The ability to have one's own biologic children is a priority to patients with cancer, and fertility loss can be a source of significant distress.[15] ASCO published updated guidelines in 2013 that recommend that oncologists discuss fertility preservation options with patients at risk for infertility as a result of their treatment.[8] Resistance among oncologists to discuss fertility issues may be due to physicians' desire to treat cancers as quickly as possible and to prioritize discussions about cancer therapy and management. Studies have found that when the prognosis is poor, oncologists are less likely to refer patients to reproductive endocrinology specialists or to bring up fertility discussions at all.[8] Physician reluctance to discuss fertility could also be due to a lack of awareness of oncofertility developments, a lack of

TABLE 2. Regional Estimates of the Potential Out-of-Pocket Financial Burden of Fertility Preservation Procedures for Patients With Cancer

Continent and Country	Coverage of Fertility Preservation Procedures	Rank of Cost to Patient
Africa		
Egypt	No coverage. Some centers at university hospitals may offer lower-cost services, and charities support patients with fewer resources. In general, the cost of a single cycle of IVF/ICSI is between 500 and 1,000 USD.	$$
Tunisia	Insurance coverage applies only for couples with demonstrated infertility. Patients must pay for gonadotropins, which often are expensive. Costs for procedures are low and vary from 80 to 135 USD depending on the procedure.	$-$$$
Asia		
China	Patients pay out-of-pocket, but the cost tends to be approximately 270 USD.	$$
India	Fertility preservation procedures are not covered by insurance. Patients must pay themselves. Tissue storage costs are, in some cases, covered by in-house funding or grants.	$$$$
Iran (Islamic Republic of)	Partial insurance coverage for ART procedures. Only counseling and preliminary tests are typically covered. However, operations and other fertility preservation techniques often are thoroughly covered by insurance, such as ovarian transposition, ovarian transplantation, and laparoscopic surgery for ovarian tissue retrieval, especially in government hospitals. However, larger insurance companies provide various treatment insurance so that patients may afford hospital expenses and even pay no money in many cases where infertility is a factor, but ART treatment is still an exception to this.	$$-$$$
Japan	Patients pay out-of-pocket (including for consultations) because insurance does not cover cryopreservation procedures, which can cost from 150 to 8,000 USD. Some municipal or prefectural governments just started financial reimbursement for fertility preservation treatment, but this is still not common.	$-$$$$
Korea (Republic of)	No insurance coverage. Patients must pay all costs for fertility preservation treatment themselves. The cost is approximately 2,000 to 3,000 USD for oocyte or embryo cryopreservation. For ovarian tissue cryopreservation, only operation costs may be partially covered by insurance. In the end, the total costs for ovarian tissue cryopreservation are similar to oocyte or embryo cryopreservation.	$$$-$$$$
Turkey	No insurance coverage.	$$$$
Europe		
Austria	Reimbursement differs from province to province. Generally, storage is not covered, which in Innsbruck amounts to 310 USD per year. Ovarian tissue cryopreservation is sometimes reimbursed by insurance, but this differs among insurance companies. Cryopreservation of oocytes and spermatozoa are not covered and must be entirely funded by patients. IVF for the generation of blastocytes may be paid for by the IVF Fund if the couple has an indication (pathospermia, endometriosis, tubal factor, or PCO), but this is handled differently depending on the institution.	$$
Belgium	Fertility preservation procedures are free to patients younger than 18 years because techniques are still considered experimental for minors. Patients with cancer older than 18 years pay a reduced price (compared with patients without cancer) of approximately 560 USD out-of-pocket *v* several thousand USD. Embryo cryopreservation is fully reimbursed in all cases. The Minister of Healthcare announced in 2016 that partial reimbursement of fertility preservation procedures for patients with cancer would begin in 2017.	0-$$
Denmark	Insurance covers the cost of ovarian tissue cryopreservation.	0
France	French social security covers all costs (whatever the technique used) for patients with a medical indication for fertility preservation. Fertility preservation without medical indication is not authorized.	0
Germany	Insurance partially covers costs.	$$
Poland	No coverage. Cost to the patient is approximately 670 to 2,780 USD for all cryopreservation procedures. Consultation and medical examinations are reimbursed under the Polish National Health Service, but ART and cryopreservation procedures, such as transplantation, are not covered. The cost of the medical consultation for a patient interested in fertility-preserving methods is reimbursed on the basis of their health insurance.	$$$-$$$$

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TABLE 2. Regional Estimates of the Potential Out-of-Pocket Financial Burden of Fertility Preservation Procedures for Patients With Cancer (Continued)

Continent and Country	Coverage of Fertility Preservation Procedures	Rank of Cost to Patient
Portugal	Consultations, medical examinations, technical procedures, and cryopreservation procedures are all covered under the Portuguese National Health Service. Medication is covered at 69%, so patients must pay for the other 31% (cost to the patient for medication is approximately several hundred USD).	0-$$
Netherlands	Most costs are reimbursed by insurance, but experimental procedures, such as cryopreservation of ovarian tissue or testicular stem cells, is paid for by the hospital.	0
Russian Federation	No coverage. The first 12 months of tissue storage costs are approximately 220 USD. For the second year on, costs are approximately 100 USD per year. Discounts are offered for long-term storage. Adolescents younger than 25 years are covered by charities.	0-$$$
Spain	Public insurance covers cryopreservation of eggs, sperm, and embryos as well as a limited number of cycles of assisted reproduction. Because ovarian cortex and immature testicular tissue cryopreservation are considered experimental procedures, they are covered by research grants.	0
United Kingdom of Great Britain and Northern Ireland	State coverage for most options (although some restrictions on access exist) and partial research funding for experimental options (ovary and testis cryopreservation) are available.	0
North America		
Canada	Varies greatly by province. In Quebec, fees for IVF procedures, cryopreservation, and medication are all covered by the government insurance plan, including storage fees. In other provinces, IVF is not government funded, but some provinces offer a tax credit, and not-for-profit foundations offer some funding. As of December 21, 2015, the Ontario government also started an Ontario Fertility Program, which covers egg and sperm freezing for oncologic/medical need. However, in all other provinces in Canada, no provincial health coverage of fertility preservation procedures exists.	0-$
Mexico	No insurance coverage. Tissue collection costs are covered by the hospital. Some IVF laboratories charge for tissue storage, whereas others may not. IVF laboratories determine costs on an individual basis. Costs to the patient are generally high.	$$$$
Panama	Costs are partially reimbursed by a private national foundation for fertility patients. Medications are reimbursed by pharmacotherapeutic companies. Patients must pay a small fee.	$$
United States	Insurance may cover some of the costs of fertility preservation procedures, but copays are usually significant. Public assistance does not cover any costs.	$$
Oceania		
Australia	Insurance will cover some costs toward day procedures, anesthesia, and egg and embryo cryopreservation, depending on the level of patient coverage and on policy. Fertility is an additional category for most insurance companies that must be selected, or the policy has to be open for a specified time, depending on the insurance type. The Australian hospitals surveyed cover the costs for fertility preservation procedures. Storage costs vary. Recently, there have been new applications for oncofertility item numbers (1) AMH testing before or after cancer treatment; (2) ovarian transposition; (3) processing and handling ovarian cryopreservation, testicular cryopreservation, and semen; and (4) psychological support during and after fertility preservation. Outcomes are pending.	$$$$
South America		
Argentina	Insurance covers the cost of most fertility preservation procedures, especially for patients with cancer.	0-$
Brazil	No coverage. The approximate cost of egg cryopreservation is 3,500-4,500 USD (with medication), embryo cryopreservation is approximately 4,500- 5,500 USD (with medication), ovarian tissue cryopreservation is approximately 4,000 USD (including the surgery), and sperm cryopreservation is approximately 400 USD. Costs vary by region as a result of tax disparities between various states and populations with distant purchasing power. No coverage exists for tissue storage as well. Cost for cryopreserved tissue storage is approximately 150 USD, with an annual maintenance cost of approximately 250 USD.	$$$$

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TABLE 2. Regional Estimates of the Potential Out-of-Pocket Financial Burden of Fertility Preservation Procedures for Patients With Cancer (Continued)

Continent and Country	Coverage of Fertility Preservation Procedures	Rank of Cost to Patient
Chile	Costs are partially covered. Insurance and public hospitals may cover some of the costs of ovarian tissue collection. Ovarian tissue cryopreservation is covered by university research grants. Sperm storage is fully paid for by public and private insurance. Oocyte and embryo banking are not covered by insurance or public assistance. The approximate cost of egg cryopreservation is 4,000 USD (with medication), whereas embryo cryopreservation is approximately 5,000 USD (with medication).	$$$$
Peru	No insurance coverage. Fertility preservation procedures for patients with cancer are just starting to be offered, so at this point, patients are responsible for all costs. Starting fee is approximately 1,500 USD for ovarian cryopreservation and an additional 600 USD for ex vivo IVM if performed in parallel (both fees do not include the expenses related to surgical procedures to remove the ovary). Cost is approximately 3,000 USD for a regular IVM procedure (including embryo cryopreservation).	$$$

NOTE. The rank of cost to patient scale is as follows: 0, no out-of-pocket costs to patients; $, very little costs to patients (eg, only storage or small costs for medications; range, 0-200 USD); $$, some costs to patients (range, 200-1,000 USD); $$$, great costs to patients (range, 1,000-3,000 USD); $$$$, no coverage or steep costs that patients are generally responsible for (range, ≥ 3,000 USD).

Abbreviations: AMH, anti-Müllerian hormone; ART, assisted reproductive technology; ICSI, intracytoplasmic sperm injection; IVF, in vitro fertilization; IVM, in vitro maturation; PCO, polycysticovarian syndrome; USD, US dollars.

time, or a lack of site-specific guidelines, especially with regard to treating pediatric patients.[8,16,17] Global strides must still be made to educate oncologists about oncofertility, the fertility preservation options available to patients, and the importance of discussing fertility with patients at the time of diagnosis.

To our knowledge, the costs and legal restrictions to care in the field of oncofertility have never been systematically identified or analyzed by region or center. This information should be readily accessible to patients and providers. Specifically, egg, sperm, and embryo donation often may not be accessible and for this reason, not discussed as a future option at the initial consultation because of financial, cultural, and legal restraints. Specifically, the respondents from the Banco de Sêmen do Rio de Janeiro in Brazil stated that the lack of compensation for sperm donors is a huge barrier to providing this service to their patients. Cultural customs play a significant role in the regulation of third-party assisted reproductive technologies, which are explicitly observed in two surveyed countries, Egypt and Tunisia. Both countries outlaw egg, sperm, and embryo donation.[18]

Lack of insurance coverage poses a great barrier to patient access to oncofertility care.[19,20] Of note, insurance in Tunisia only covers costs of fertility preservation procedures in cases where a couple has demonstrated infertility. Infertility is difficult, if not impossible, for pediatric and unmarried patients to prove, which imposes an undue financial challenge to this proportion of oncofertility patients. Costs for fertility preservation procedures in Tunisia remain lower than at other sites, but only approximately 50% of patients follow through with procedures because of the high cost of gonadotropins.

In the United States, a paradox exists about insurance coverage of fertility preservation procedures. Insurance generally covers the costs of iatrogenic conditions that result from cancer treatment, such as mastectomy and wigs for alopecia.[21] However, despite the fact that infertility as a result of cancer is iatrogenic, fertility preservation procedures are considered an exception and often are not covered by government-subsidized national insurance or private companies.[21] Insurance companies require burden of proof for infertility; therefore, couples must demonstrate 1 year of unsuccessful attempts to conceive before they receive the diagnosis of infertility. This policy is unacceptable because fertility preservation addresses the potential future infertility of currently fertile individuals.[21] Changes in policy are needed to ensure that all iatrogenic conditions after cancer treatment are covered by national health insurance systems, and hopefully, private insurers will follow suit.

As of 2016, 31 countries are part of the surveyed OC Global Partners Network. This list is not exhaustive, and oncofertility practicing organizations in other countries were not included in this analysis. That said, this study represents a first attempt to quantify services in this emerging discipline. Fertility management is complex and must take into account culturally sensitive attitudes within each region of the world, and reanalysis of the services provided is important as this field expands.

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APPENDIX

TABLE A1. Respondent Organizations Listed by Continent and Country (organized according to the United Nations Statistics Division geographical region groupings)

Continent and Country	Respondent Organization
Africa	
Egypt	National Research Centre of Egypt (NRC)
Tunisia	ART Center, Aziza Othmana Hospital of Tunis
Asia	
China	The First Affiliated Hospital of Nanjing Medical University
India	Centre for Fertility Preservation, Kasturba Medical College, Manipal University
Iran (Islamic Republic of)	Royan Institute
Japan	Gifu University Graduate School of Medicine
	Japan Society for Fertility Preservation (JSFP), St Marianna University School of Medicine
Korea (Republic of)	The Korean Society for Fertility Preservation (KSFP), Seoul National University Bundang Hospital
Turkey	Onkofertilite Turkiye
Europe	
Austria	Medical University of Innsbruck, Austria
Belgium	Centrum voor Reproductieve Geneeskunde (CRG)
Denmark	University Hospital of Copenhagen, Laboratory of Reproductive Biology
France	Hôpital Jean-Verdier
Germany	Medical Faculty of Cologne, Uniklinik Köln
Poland	Oncofertility Poland, Jagiellonian University Medical College
Portugal	Centro de Preservação da Fertilidade
Netherlands	Radboud University Medical Center (Radboudumc)
Russian Federation	Biologic Cryobank
Spain	Instituto de Investigación Sanitaria La Fe, Hospital Universitario y Politécnico La Fe
United Kingdom of Great Britain and Northern Ireland	Edinburgh Fertility & Reproductive Endocrine Centre
North America	
Canada	McGill University Health Centre Reproductive Centre
Mexico	Instituto Nacional de Ciencias Médicas y Nutrición Salvador Zubiran
Panama	IVF Centro de Reproducción (IVFPANAMA)
United States	Oncofertility Consortium, Northwestern Medicine
Oceania	
Australia	Royal Children's Hospital Melbourne Australia
	Sydney Children's Hospital and Prince of Wales Hospital Sydney Australia
South America	
Argentina	Pregna Medicina Reproductiva
Brazil	Banco de Sêmen do Rio de Janeiro
	Clínica IVI São Paulo - Brasil
	Fertilitat Centro de Medicina Reprodutiva
	Fertility Preservation Research Group of the Federal University of São João Del Rei
	Fertipraxis Centro de Reprodução Humana

(Continued on following page)

TABLE A1. Respondent Organizations Listed by Continent and Country (organized according to the United Nations Statistics Division geographical region groupings) (Continued)

Continent and Country	Respondent Organization
	GENESIS - Centro de Assistência em Reprodução Humana
	Hemoce - Centro de Hematologia e Hemoterapia do Ceará
	Huntington Medicina Reprodutiva
	Pró-Criar Medicina Reprodutiva
	Universidade Federal de Minas Gerais Human Reproduction Laboratory
	Vida Centro de Fertilidade
Chile	Centro de Reproducción Humana - Universidad de Valparaíso (CRH-ultraviolet)
Peru	Centro de Estudios e Investigaciones en Biología y Medicina Reproductiva - BIOMER

NOTE. Composition of macro geographical (continental) regions, geographical subregions, and selected economic and other groupings (United Nations Statistics Division, 2016. http://unstats.un.org/unsd/methods/m49/m49regin.htm).

TABLE A2. Survey Questions Asked of Oncofertility Consortium Global Partners Network Members and Other Experts in the Field and the Corresponding Number of Respondent Organizations

Survey Question	No. of Respondents
Is there a patient referral system at your center? If yes, does your center have a nurse navigator, social worker, or specific oncofertility patient navigator? Please describe.	40
Do you provide psychological support to patients? If yes, please describe.	40
Does your center have a registry?	40
Which fertility preservation methods does your center offer to patients? See options given in Figure 1	40
Which methods are used most often?	40
Are there any services that are not offered due to cultural/religious boundaries or other restrictions? Please explain.	23
On average, how long does the process take from diagnosis to consult?	37
On average, how long does the process take from consult to fertility preservation?	37
On average, how long does the process take from fertility preservation to cancer treatment?	36
Please describe in detail the referral process at your center. Are the referral rates known? If so, what are the referral rates?	30
Does insurance cover the costs of fertility preservation procedures? If no, how do patients pay for fertility preservation services and about how much do services cost? Do you feel that these costs may deter patients from seeking fertility preservation procedures? Please be specific.	37
What barriers or challenges do you face at your center, if any?	37

TABLE A3. Frequency and Percentage of Yes/No Responses

Survey Question	Yes	No	Total	Yes, %	No, %
Is there a patient referral system at your center?	30	10	40	75	25
Does your center have a nurse navigator, social worker, or specific oncofertility patient navigator?	9	25	34	27	73
Do you provide psychological support to patients?	30	10	40	75	25
Does your center have a registry?	35	5	40	87	13
Does insurance cover the costs of fertility preservation procedures?	11	26	37	30	70
Are there any services that are not offered due to cultural/religious boundaries or other restrictions?	14	9	23	61	39

TABLE A4. Average Referral Times Indicated by Respondent Organizations

Type of Referral	Time	Frequency	%
Time from cancer diagnosis to fertility preservation consultation.	1-2 days	14	35
	3-5 days	9	23
	1 week	8	20
	2 weeks	4	10
	> 3 weeks	2	5
	No response	3	7
Time from fertility preservation consultation to fertility preservation.	1-2 days	9	23
	3-5 days	9	23
	1 week	7	17
	2 weeks	8	20
	> 3 weeks	4	10
	No response	3	7
Time from fertility preservation to cancer treatment.	1-2 days	8	20
	3-5 days	11	27
	1 week	8	20
	2 weeks	5	13
	> 3 weeks	4	10
	No response	4	10

