

Fertility Preservation Care for Children and Adolescents with Cancer: An Inquiry to Quantify Professionals' Barriers

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Purpose: There is a growing interest in fertility preservation as emerging research is highlighting the prevalence of infertility among young cancer survivors and its negative impact on quality of life. Previous qualitative research has identified barriers of fertility preservation care among professionals. The aim of this study was to assess the prevalence of these barriers among pediatric and adolescent oncology healthcare professionals and evaluate factors that influence them.

Methods: Based on previously identified barriers and experts' input, a questionnaire was developed and sent to 88 professionals drawn from the multidisciplinary pediatric and adolescent oncology team of a large Principal Treatment Centre. Multivariate analysis was performed to evaluate which factors influence professional adherence to fertility preservation care.

Results: In total, 48 (55%) professionals responded and were included in the analysis. All pediatric and adolescent oncology healthcare professionals reported at least one barrier to fertility preservation care. Even though some interdisciplinary differences were observed, the most frequently endorsed barriers were focusing on patients' characteristics (age, health status, urgency of cancer treatment, and lack of interest in fertility issues). The least frequently endorsed barriers were related to organizational aspects (availability of fertility specialists, time constraints, and ability to raise fertility issues). Nurses and allied healthcare professionals endorsed knowledge or policy gaps as barriers to a greater degree than medical doctors.

Conclusions: Results suggest that educational support provision, especially for nurses and allied healthcare professionals, and strengthening interdisciplinary collaborations could help overcome observed barriers and facilitate fertility discussions with pediatric and young cancer patients.

Keywords: barriers, fertility preservation, oncology healthcare professionals, survey, young cancer survivors

Introduction

WITH IMPROVEMENTS IN cancer diagnosis and treatment, overall survival rates for children and young people diagnosed with cancer have improved considerably, now exceeding 80% for 5-year survival.¹ Life-saving cancer treatment can cause long-term effects on young cancer survivors' physical growth, fertility, family life, and social relationships, which could subsequently reduce their psychological well-being and quality of life.² It is, thus, necessary that healthcare professionals caring for such patients have knowledge

concerning the risks of adverse long-term effects of life-saving cancer treatments to provide appropriate care, help improve the quality of life of young cancer survivors, and ensure equality of opportunity for a full and productive life.

Infertility, along with the fear of cancer relapse, has been recognized as the number one concern of young cancer survivors that has shown to influence their quality of life causing significant distress.³ The recognition of the long-term sequelae of infertility in the quality of life of young cancer survivors^{4,5} has led to a heightened awareness of the need to provide all cancer patients of young age with fertility support

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that involves counseling about the risks of gonadotoxicity and available fertility preservation options before cancer treatment. Advances in reproductive medicine and cryobiology have led to the development of various fertility preservation techniques some of which are now considered well established, such as embryo or oocyte cryopreservation for women and sperm cryopreservation for men, while others are still experimental, such as ovarian or testicular tissue cryopreservation. This along with published guidelines^{6–10} and advocacy work from charities and patient groups¹¹ has contributed to increased oncology healthcare practitioners' awareness of the importance of fertility preservation issues. Nevertheless, literature shows that there is a gap between oncology healthcare professionals' awareness of the need to offer fertility support and offering such support to their young cancer patients.^{12–16}

Previous qualitative research has explored reasons preventing oncology healthcare professionals from offering fertility support to young cancer patients. Indeed, barriers to fertility preservation care have been identified both at organizational and patient-doctor level.¹⁷ Oncology professionals indicate a lack of institutional support as a main barrier; this may manifest as lack of institutional guidelines and policies, clinicians' time constraints, or inappropriate facilities.^{12,14,18–20} Moreover, limited knowledge, limited communication skills, and misinterpretation of patients' wishes are experienced as the main intrinsic barriers.^{12,14–16,21} Understanding the impact of these barriers on pediatric and adolescent oncology healthcare professionals' adherence to fertility preservation care is necessary to be able to implement effective fertility support for young people with cancer. Therefore, the aim of this study was to quantify the barriers of fertility preservation care among professionals through the development and use of a survey tool and to analyze which factors influence professionals' adherence to fertility preservation care.

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Participants

This preliminary study was approved by the local Research Ethics Committee and included healthcare professionals drawn from the multidisciplinary pediatric and adolescent oncology team of a single Principal Treatment Centre. The chosen Principal Treatment Centre is one of the largest pediatric and adolescent oncology units with a multidisciplinary team structure, which is representative of cancer treatment centers in the United Kingdom. Nursing staff and allied healthcare professionals, such as counselors, alongside doctors play a key role in the care of cancer patients. They tend to have more interactions with patients throughout the cancer trajectory and they are commonly asked to assist patients and parents with psychosocial problems caused by cancer or cancer treatment, including infertility or explain available management options.^{22,23} Barriers experienced by any member of the multidisciplinary team could, thus, affect the delivery of effective fertility support for young cancer patients. Therefore, this study recruited doctors of all hierarchical grades, nurses, and allied healthcare professionals working in pediatric and adolescent oncology. Recruitment occurred at the pediatric and adolescent oncology Principal Treatment Centre of the North East of England. Eligibility

criteria included the following: (1) pediatric and adolescent oncology healthcare professional based at the Great North Children's Hospital, United Kingdom; (2) respondent filling in the questionnaire for the first time; (3) respondent able to understand and consent to the study.

Measures

Survey tool development. We used a two-step process to develop the questionnaire. First, we drafted a preliminary survey by identifying content domains in previously published studies that were relevant to oncology professionals' barriers to fertility preservation care.^{12,17,24} Individual items within these domains were modified from existing questionnaires or constructed *de novo*. Through this process, an initial survey item pool was generated that included items meeting certain criteria. These criteria included the following: (1) responses to items would be revealing of perceived barriers in relationship to fertility preservation care; (2) items were worded to be applicable to the pediatric and adolescent oncology multidisciplinary team; (3) asked about a single issue; (4) were unambiguous; (5) could be phrased as short questions; and (6) used simple language.

Subsequently, we convened a panel of three experts to assess content validity and facilitate item reduction. Experts included a pediatric and adolescent oncologist who had been involved in the design of regional fertility preservation services for young people with cancer, an academic oncologist with a research interest in fertility preservation care, and a reproductive medicine expert. The experts were asked to identify any missing relevant items and to evaluate included items for significance in identifying professionals' barriers to fertility preservation care. Items that were not thought to be significant were excluded. The expert panel-revised survey was subsequently formatted. Response scales were then matched to item content using Likert-type scale response anchors.²⁵

The survey was pretested by four healthcare professionals that included one doctor, one nurse, and two PhD students. After participants completed the survey, they were asked to provide feedback on (1) item understandability, by asking participants whether they were able to understand each item; (2) usability, by asking participants to give feedback on the length of the questionnaire, the flow of questions, response categories for each question, and their willingness to complete the questionnaire; and (3) face validity, by asking participants whether the questionnaire items measure barriers of fertility preservation care. Participants' feedback was analyzed by the research team. As feedback was positive with regards to understandability, usability, and face validity, no significant modifications were needed to the final version of the survey.

Demographic factors. Participants completed a measure of demographic information including age, gender, discipline, and time in clinical post. Our analysis of demographic correlates of barriers to fertility preservation care was exploratory, but we expected professionals with less experience in fertility support to report more barriers to fertility preservation care based on prior work in oncofertility.^{26–28}

Barriers to fertility preservation care

Barriers to fertility preservation care were assessed with a newly developed 12-item scale. Pediatric and adolescent

oncology healthcare professionals were asked to rate the extent to which each statement may have an impact on their discussions regarding fertility or fertility preservation with their young cancer patients and their families using a four-point scale where one indicates not a barrier, two indicates somewhat a barrier, three indicates moderate barrier, and four indicates extreme barrier. The last item was open-ended, allowing the respondents to add barriers but was not scored. For the purposes of this study, barriers were seen as multidimensional constructs where a respondent's perception of one barrier does not necessarily predict the same respondent's perception of a different barrier.²⁹ As a result of this assumption and because this was the first systematic examination of various barriers to fertility preservation care among pediatric and adolescent oncology healthcare professionals, individual barrier items were subsequently analyzed.

Procedures

This study received Institutional Review Board and Research Ethics Committee approval. Potentially eligible healthcare professionals were identified by the site research coordinator. The survey instrument along with information on the study's aims, objectives, and processes was distributed both electronically and in print over a 2-month period to all eligible individuals. Follow-up emails were subsequently sent to all eligible healthcare professionals in a fortnightly basis encouraging them to complete the survey if they had not yet done so. Respondents were not given any incentives. To avoid information bias deriving from social desirability attitudes, respondents were asked to complete the survey anonymously. Researchers were, thus, blinded to the list of individuals who did or did not participate in the survey. No data were collected from nonrespondents.

Statistical analysis

Barriers to fertility preservation care were descriptively characterized by examining medians, interquartile rates, and consensus indexes for individual items. The consensus index represents the degree of agreement with each statement, in which the values vary from 0 (perfect disagreement) to 1 (perfect agreement) and is defined as follows:

$$Cns(X) = 1 + \sum_{i=1}^n p_i \log_2 \left(1 - \frac{|X_i - mean|}{d_x} \right),$$

where d_x is the width of X and $d_x = X_{max} - X_{min}$. It, thus, allows a quantitative assessment of respondents' consensus for each barrier item.³⁰

The percentage of pediatric and adolescent oncology healthcare professionals for each level of the barrier scale is also reported for all assessed barriers. The data were screened for missing values. No missing value was replaced and nonresponses were not included in further analyses. Cronbach's alpha (α) coefficient was used to calculate the internal consistency of the items for the barriers scale. Finally, to evaluate demographic correlates of barriers, a multivariate analysis of variance (MANOVA) with Wilks' lambda was used to evaluate whether any of the barriers were related to each demographic covariate. *Posthoc* analyses of variance (ANOVAs) were subsequently employed to identify

which individual barriers were associated with the covariates selected through MANOVAs that had p -values below 0.05. Data were analyzed using SPSS version 22.0.0.0 software (SPSS, Inc., Chicago, IL).

Results

Overall response rate was 55% (48 respondents) in this pilot study. Table 1 shows characteristics of the sample completing the barrier study. There was a balanced representation of all disciplines involved in the care of children and adolescents with cancer that reflects workforce characteristics of the oncology multidisciplinary team with 26% of respondents being oncology doctors, 65% nurses, and 9% allied healthcare professionals. The majority of respondents were female (87%) and younger than 50 years of age (75%). Respondents' clinical experience varied, ranging from 2 months to 21 years in current post (mean = 5.7 years, standard deviation = 5.8 years).

There was a discrepancy between the response rates of the medical (response rate 93%) and nonmedical (47%) group of respondents. Respondents explained that doctors were more likely to discuss fertility, fertility preservation, and referral to fertility specialist with their young cancer patients and their families. This observation reflects a practice, not thought to be unique to the studied oncology team,³¹ where pediatric and adolescent oncology doctors feel the responsibility of discussing fertility and fertility preservation issues should mainly be part of their own role.

Validity and reliability analyses

This survey instrument has demonstrated adequate reliability (Cronbach's alpha score of 0.88 for the barriers scale). Careful selection of survey items and involvement of subject matter experts ensured adequate content and face validity. Moreover, respondents' answers to an open-ended question about barriers to fertility support provision failed to reveal additional barrier themes as no additional barriers were mentioned; this further supports survey's face validity. A Kruskal–Wallis H test revealed differences in the majority of

TABLE 1. DEMOGRAPHIC CHARACTERISTICS OF THE SAMPLE

Characteristics	No. of participants (n=48), n (%)
Age	
<50 years old	36 (75)
≥50 years old	12 (25)
Gender	
Female	42 (87)
Male	6 (13)
Healthcare profession	
Doctor (all grades)	13 (27)
Nurse	31 (65)
Allied healthcare professional	4 (8)
Clinical experience	
Time in post	
<2 years in current clinical post	17 (37)
2–5 years in current clinical post	9 (20)
≥5 years in current clinical post	20 (43)

barrier scores between the different groups of pediatric and adolescent healthcare professionals. As professionals with different level of experience in fertility support provision are expected to report different levels of barriers, Kruskal–Wallis H test results provide preliminary evidence for the construct validity of the barrier scale.

Barriers to fertility preservation care

All respondents reported at least one barrier that could hinder discussions about fertility or fertility preservation with their pediatric and adolescent cancer patients and their parents. Descriptive information for each item is shown in **T2** ▶ Table 2. Of the choices provided on the survey, the most likely reason for healthcare professionals to omit discussions of fertility issues or fertility preservation options was a patient’s age (at least “somewhat” a barrier for 85% of respondents) and medical condition (85%), patient’s or family’s lack of interest in fertility discussions (82%), and their own knowledge gaps (77%). Existing infrastructure of fertility and oncology services and discomfort with discussing fertility issues or fertility preservation with their patients were least frequently endorsed as barriers to fertility preservation care. In general, the level of agreement between respondents for endorsement of specific barriers, as measured by the consensus index, differed over the different perceived barriers to fertility support delivery for pediatric or adolescent cancer patients. There was a high level of agreement among respondents about the factors less frequently endorsed as barriers to fertility preservation care, such as existing infrastructure (57%–64% as assessed by the consensus index). On the contrary, though, the consensus was generally low for

knowledge gaps (consensus index of 36%) and information resources, such as availability of clinical guidelines, protocols, or patient information leaflets (consensus index of 42%–48%) as barriers of fertility preservation care.

Demographic correlates of barriers to fertility preservation care

Overall very few demographic variables were associated with barriers to fertility preservation care. The MANOVA estimated effects of demographic covariates on the collection of barriers are summarized in Table 3. Barriers 9 (“there are no protocols on fertility support”), 10 (“there are no guidelines on fertility support”), and 11 (“there is no adequate information on fertility preservation”) were found to be highly correlated (Pearson correlations larger than 0.7).³² Therefore, to avoid multicollinearity problems, barriers 10 and 11 were removed from the MANOVA analyses. Healthcare profession was a significant covariate in the MANOVA, indicating that this characteristic is predictive of at least one of the barriers assessed through the survey instrument. Follow-up ANOVAs indicated that healthcare profession was predictive of barrier item 5 (“I don’t have adequate knowledge on fertility preservation”), and 9 (“there are no protocols on fertility support”). Nurses and allied healthcare professionals endorsed the lack of knowledge and adequate understanding of fertility preservation options as a barrier to fertility preservation care (mean score: 3 vs. 1.5) to a greater degree than medical doctors ($F(1, 38) = 22.41, p < 0.0005; \text{partial } \eta^2 = 0.371$). Moreover, nurses and allied healthcare professionals endorsed the lack of clinical guidelines on providing fertility support (mean score:

TABLE 2. DESCRIPTIVE INFORMATION OF PEDIATRIC AND ADOLESCENT ONCOLOGISTS’ BARRIERS TO FERTILITY PRESERVATION (N=48)

Barrier item	Median (IQRs)	Consensus, %	% who described item as			
			Not a barrier	Somewhat a barrier	Moderate barrier	Extreme barrier
1. A patient is too young to consider fertility preservation	3 (1)	50	15	29	38	18
2. A patient is too ill to consider fertility preservation	3 (1)	53	15	22	48	15
3. A patient has no time to consider fertility preservation	2 (1)	42	26	26	31	17
4. Patient or parents do not want to discuss fertility preservation	3 (1)	48	18	31	33	18
5. I don’t have adequate knowledge on fertility preservation	3 (2)	36	23	20	27	30
6. I feel uncomfortable discussing fertility or fertility preservation	1 (1)	63	61	30	7	2
7. I don’t have enough time to discuss fertility or fertility preservation	1 (1)	64	59	28	13	0
8. There is no place/fertility specialist to refer for fertility preservation	1 (1)	57	65	22	9	4
9. There are no trust protocols on fertility support	2 (2)	42	33	31	25	11
10. There are no clinical guidelines on fertility support	2 (2)	48	33	19	36	12
11. There isn’t adequate information on fertility support	2 (2)	47	34	23	25	18

Consensus was measured according to the consensus index method. IQRs, interquartile range.

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TABLE 3. EFFECTS OF DEMOGRAPHIC COVARIATES ON THE COLLECTION OF BARRIERS CALCULATED THROUGH MULTIVARIATE ANALYSIS OF VARIANCE

<i>Barrier items one through nine in MANOVA</i>		
<i>F-statistic and p-value from Wilks' lambda</i>		
<i>Multivariate</i>		
	<i>F-statistic</i>	<i>p</i>
Healthcare profession	$F(9, 28) = 2.331$	0.042 ^a
Age	$F(9, 28) = 0.904$	0.535
Gender	$F(9, 28) = 1.365$	0.251
Clinical experience	$F(18, 52) = 1.271$	0.246

^aStatistically significant results. MANOVA, multivariate analysis of variance.

2.4 vs. 1.6) to a greater degree than medical doctors ($F(1, 38) = 4.827, p = 0.034$; partial $\eta^2 = 0.113$).

Discussion

To the best of our knowledge, this was the first study to examine barriers to fertility preservation care among the multidisciplinary group of pediatric and adolescent oncology healthcare professionals. All respondents reported at least one barrier to fertility support for their young cancer patients. Even though some interdisciplinary differences were observed, reported barriers were mainly related to clinical aspects of individual cases, such as patients' age, health status, openness to fertility discussions, and time required for fertility preservation. As the aforementioned clinical characteristics are not absolute barriers to fertility discussions, it is apparent that the real barrier was practitioners' perception of the role these characteristics might play in patients' receptiveness of fertility or fertility preservation discussions. This is a consistent finding within the fertility preservation care literature, which further highlights the influence of individual multidisciplinary team members in cancer care planning.^{26,33,34}

As patients' expectations remain largely unknown due to the limited number of studies discussing decisions on fertility preservation in the pediatric and adolescent population, healthcare practitioners may feel pressurized to make decisions based on assumptions of their patients' information needs and wishes regarding future fertility. Recent studies, though, have shed light on young people's preferences for fertility support at the time of cancer diagnosis and challenged assumptions based on clinical characteristics.^{31,35,36} Healthcare professionals' approach to fertility preservation has been recognized as a major influencer of patients' decision-making processes.^{37,38} It is, therefore, important that clinicians develop effective strategies for discussing fertility issues and fertility preservation options with their young cancer patients and their parents.

In addition to barriers related to aspects of fertility support related to values, attitudes, and beliefs, nurses and allied healthcare professionals also reported barriers related to technical aspects, namely knowledge gaps and lack of fertility preservation care protocols. This is a consistent finding within the fertility preservation care literature^{26,27,39} that

highlights the need for training support for healthcare professionals who play a key role in the care of young cancer patients. The development of educational programs could help overcome barriers related to knowledge gaps and, along with clinical protocols on fertility preservation care, could support nurses and allied healthcare professionals to expand the confines of their practice and communicate more confidently about reproductive health with young cancer patients and their families. Examples of such educational programs⁴⁰⁻⁴² have been presented and shown to be effective in improving the understanding of fertility and fertility preservation issues related to cancer diagnosis and treatment among nurses and allied healthcare professionals while also working as catalysts for institutional level changes.

This study is limited by its reliance on self-reporting. Self-reporting and lack of data from nonrespondents might have led to a false estimate of healthcare professionals' perceived barriers to fertility preservation. Moreover, the survey research design does not allow for in-depth exploration of barriers to fertility preservation. Causal inferences cannot, therefore, be drawn based on the available results. Finally, the involvement of only one site presents a further limitation of this study, which was, though, designed as a first step toward establishing baseline figures and to assist in designing further representative surveys. Moreover, there was diversity in the range of pediatric and adolescent oncology healthcare professionals who participated in the study representing a large center treating the full range of cancer diagnoses. This study is significant because it is the first study to systematically characterize pediatric and adolescent oncology healthcare professionals' barriers to fertility preservation. In addition, the perspective of the multidisciplinary team rather than that of physicians alone is presented. It, thus, provides benchmark data on different dimensions of fertility support for children and young people with cancer. The results of this study can help clinical leaders, quality managers, and front line staff to identify barriers and facilitators related to the implementation of fertility support at the local setting and plan strategic improvement activities.

Future research should focus on designing effective implementation interventions to improve fertility support provision. Implementation strategies should focus on matching identified barriers to interventions shown to create a receptive environment⁴³ while taking into account the local context, as this approach has been shown to be more effective in bridging evidence and clinical practice gaps.⁴⁴ Finally, implementation effects should be assessed and the associations between intervention components and implementation effects should be defined to ensure that implementation strategies are based on robust evidence rather than on intuition.

In conclusion, despite efforts to improve fertility support provision for children and young people with cancer, barriers still remain that prevent pediatric and adolescent oncology healthcare professionals to fully engage in fertility preservation discussions. The most frequently endorsed barriers focused on perceived patients' personal characteristics, while knowledge gaps were also recognized as a barrier to fertility preservation care. These results suggest that developing educational interventions and strengthening interdisciplinary collaborations can help facilitate fertility preservation discussions with pediatric and young adult cancer patients at the time of their cancer diagnosis.

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Author Disclosure Statement

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