

Parental knowledge of fertility in male childhood cancer survivors

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Abstract

Background: In childhood, cancer survivors fertility is a major point of concern. In boys, only semen analysis and impregnation confirm fertility. Since parents constitute a major source of information for children, we investigated recall and assumptions on their child's fertility.

Procedure: One hundred and fifty-nine families with a boy surviving from cancer were asked for recall and expectations on fertility.

Results: Fifty-two percent of parents recalled statements on fertility, in 36% this was not so, 12% did not remember. There were no differences for parental gender and age at diagnosis. In case of intensive treatment parents were better informed. After relapse parents were less informed. Nine percent of the parents expected infertility, 60% was uncertain, 31% expected normal fertility.

Conclusions: Based on our and literature findings we conclude that only about half of the parents recalls information on fertility. Lack of information, despite written information, is probably caused by limited oral information provision and defective memorization. One-third of the parents assumed a normal fertility in their sons. It is highly recommended to check whether parents are adequately informed on fertility at moments they have coped the problems and emotions at initial diagnosis or at relapse, and if needed repeat the information.

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Introduction

The success on survival in children treated for malignancies has led to shifts in parental worries. Survival was formerly the primary point of concern; nowadays late effects are important issues as well. Fertility is one of these points. In the literature, many studies on assumptions on cancer survivor fertility and their psychosocial consequences are published. In the case of a child with cancer, parents are often the cornerstones with respect to collection of information. In fact, they are leading actors in provision of information to their child. Many parents often suspect normal fertility in girls at the moment regular periods occur. In boys, both parents and patients are often totally blindfolded until procreation is attempted or semen analysis is performed. To our knowledge no studies were published investigating the parental memorization of information and expectations on their son's fertility after cancer treatment. In this study, we tried to delineate these points and related them with patient characteristics.

Materials and methods

In September 2005, all parents of 159 male chemotherapy-treated childhood cancer survivors

diagnosed in the Emma Children Hospital in the period ranging from September 1995 to September 2003 were sent short questionnaires, inquiring for year of birth, age at initial diagnosis, type of malignancy and possible relapse. The remaining questions inquired whether at initial diagnosis information on possible secondary infertility was provided, sperm analysis after treatment in pubertal boys was carried out and parental expectation whether their child would be infertile. All these questions could be answered by 'yes/no/uncertain'. Each parent was asked to fill in a single questionnaire independently (Figure 1). All parents had been informed on the fertility issue at the consent procedure. Besides the oral information two other means to inform them were the handing to all parents the book '*Kinderen en Kanker*', Eds Berendt, Van den Berg, Van de Wetering, Amsterdam, Boom Publishing (ISBN 9789053527221, or its the preceding editions) in which the fertility issue is addressed and secondly a diary with leaflets on the specific cytostatic drugs used in their child.

For statistical analysis SPSS-software was used. For frequency distribution between subgroups chi-square analysis and for correlation Pearson's test were used.

Questionnaire			
Name of the child			
Relation to the child	Father	Mother	
Foster parent *	Yes	No	
Age at diagnosis			Years
Name of the disease			
Did the disease relapse*	Yes	No	
Were you informed on fertility or infertility *	Yes	No	Uncertain
Was there a sperm analysis *	Yes	No	Uncertain
Was sperm collected	Yes	No	
Was it mentioned that treatment was so intensive that infertility was likely*	Yes	No	Uncertain
Do you expect that your son is infertile*	Yes	No	Uncertain
* circle the right answer			

Figure 1. Questionnaire

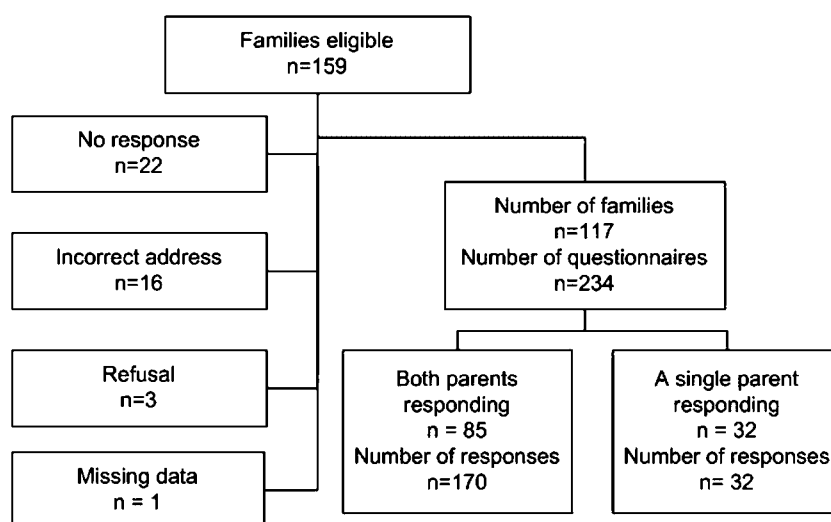


Figure 2. Consort diagram

Results

Patient characteristics

In total 202 questionnaires, representing 117 children, were returned (see Figure 2). Distribution according to original diseases was as follows: 28% acute lymphoblastic leukemias, 15% non-Hodgkin's lymphomas, 13% Wilms' tumors, 11% neuroblastomas, 8% brain tumors, 6% Ewing's sarcomas, 4% rhabdomyosarcomas, 4% osteosarcomas, 4% germ cell tumors, 2% acute myeloid leukemias, 5% a remaining group of miscellaneous tumors. One hundred and seventy questionnaires were from 85 children in whom both the parents had filled in the form. Seventy-three percent of the

families had returned at least one questionnaire; in total 63% of the questionnaires were returned. In five cases a single questionnaire was filled in by both the parents; in these cases the data provided were ascribed to each parent on its own. Fifty-three percent of questionnaires originated from the mother. Ages at initial diagnosis ranged from 0 to 17 years (mean 6.4 years). Current ages ranged from 3 to 24 years (mean 13 years). In 33 questionnaires (18 cases) a relapse of the malignancy was reported.

Parental recall and expectations

Fifty percent of parents recalled statements on an effect on fertility, 36% indicated that this had not

Table 1. Recall of information and expectations on fertility

		All parents	Parents from relapsing patients	Parents from more intensive treated patients (Group B)
Recall of information	Information has been given	101/202 (50%)	6/33 (18%)	61/106 (58%)
	Does not remember information	73/202 (36%)	23/33 (70%)	31/106 (33%)
	Uncertain on provision of information	28/202 (12%)	4/33 (12%)	14/106 (13%)
Expectations on fertility	Normal fertility	63/202 (31%)	8/33 (24%)	28/106 (26%)
	Certain on infertility	18/202 (9%)	9/33 (28%)	10/106 (9%)
	Uncertain on fertility	121/202 (60%)	16/33 (48%)	68/106 (64%)

been the case (Table 1). The remaining 12% was not sure on provision of information. In four cases sperm analysis after treatment had been done. In 14 cases semen was collected prior to therapy start; in two cases the parent was uncertain whether this was performed. Nine percent of the parents thought that infertility was indeed a fact; in 60% of cases parents were uncertain whether their sons were fertile; 31% expected a normal fertility.

Subgroup analysis

There was no difference in responses to all questions of *fathers versus mothers* (for the various questions correlation coefficients were high; ρ 's ranging from 0.346 to 0.618, all significant at the 0.001 level).

To discern at diagnosis *pubertal versus pre-pubertal* boys an arbitrary cutoff age of 12 was used. Ninety children were at initial diagnosis below this age, 27 were older. From the 162 parents of children in the younger age group 80 stated to be informed on fertility issues, 60 stated not to be informed and 22 were uncertain having been informed. In the older age group, 25 parents stated to be informed on fertility issues, 14 stated not to be informed and one was uncertain having been informed (not significant). No difference in the assumptions on actual fertility for both the groups was reported. Additional analysis for at diagnosis prepubertal boys, who were (post-)pubertal at the moment of delivering of the questionnaire, did not reveal significant differences.

With respect to a *later relapse* a difference was found for parents with a child who had suffered from a relapse ($n=33$). Six parents stated to be informed on infertility, four were uncertain, 23 stated not been informed. Nine parents assumed that their son was infertile. Comparison with non-relapsing cases were highly significant, i.e. less informed in case of a relapse $p=0.045$ and expecting to be infertile $p=0.004$, respectively.

On the basis of diagnosis two groups *with respect to treatment intensity* were discerned: group A comprised parents of children in whom treatment would probably not endanger fertility (non-relapsing ALL, thyroid carcinoma, brain tumor, neuroblastoma, germ cell tumor, miscellaneous

tumors, $n=96$). Group B was composed of parents of children in whom a compromised fertility was likely (relapsing or transplanted ALL, osteosarcoma, AML, neuroblastoma, Hodgkin's disease, non-Hodgkin's lymphomas, Ewing tumors, rhabdomyosarcoma, $n=106$). Special attention was paid to cases who had possibly received high doses of alkylating agents. However, all patients in group A had not received such treatment. Parents from group B more often mentioned to be informed on fertility (58 versus 41%, $p=0.068$); the percentages of parents who were uncertain to be informed were similar (13 versus 10%). Parents of pubertal boys mentioned to be informed in 84% in the case of a group B child, whereas none of the parents from group A until the moment of filling in the questionnaire pubertal son could recall to be informed ($p<0.001$). Semen collection was more often offered to children planned to get intensive chemotherapy. Of 26 boys >11 years at initial diagnosis 20 were offered sperm collection ($p<0.001$). Assumptions on actual fertility were similar for parents with children in group A or B. No differences were found in relation to the actual age of their son.

Discussion

Actual infertility does not only influence procreation, but even the suspicion to be at risk for infertility has profound effects on body image, dating and marriages [1–4]. In long-term childhood cancer survivors at least 53% of men and 65% of women have worries whether they can have children [5,6]. A major factor with respect to these worries can be the limited knowledge on the effects of their treatment, due to inadequate processing and as a result forgetting information. Parents are often an important source of information in case a child suffers from a malignancy. Especially at the moment children grow older parents give age-specific information.

Our data indicate that although we were sure that they had been informed, half of the parents had knowledge deficits on the fertility issue since they cannot recall information. These figures are fairly in line with the findings from investigations

made among young cancer survivors themselves. Zebrack *et al.* reported that 19 out of 32 long-term survivors are unaware of fertility status. From these 19 patients only four do not think about it. Out of the 32 patients 18 recalled someone saying something about procreation. Only 11 of these 32 patients were aware of fertility status by being pregnant, by sperm testing or by impregnation [7]. Schover *et al.* [8,9] reported that only 60% of young male survivors recalled to be informed on the fertility aspects. It was further described that cancer survivors have more worries on possibilities for conceiving a child in comparison with peers [10]. The importance of individuals to have adequate information on their fertility can be further illustrated by reports in the literature, mentioning that at least half of the young male cancer survivors wants to have children. The majority would consider adoption and a quarter donor insemination in the case of infertility [8,9].

The lack of information in childhood cancer survivors may also be related with withholding of information given by the care providers and/or parents. Goodwin *et al.* investigated attitudes and practices in pediatric oncology healthcare providers. Although 93% of these 30 care providers (16 physicians and 14 nurse practitioners or research nurses) state that they routinely discuss the impact of cancer treatment on future fertility, 25% state not to discuss fertility issues in patients with a poor prognosis. In case no gonadotoxic treatment is given only 74% of care providers give information on fertility. Most care providers (80%) felt that older patients were more often concerned about fertility issues, which probably will have its drawback on provision of information given to pediatric oncology patients/parents. With respect to the timing of information, half of the care providers stated that it is inappropriate to do it at the moment of giving consent for treatment [11]. Especially, after having finished the therapy, information on fertility becomes important. Goodwin *et al.* reported on the assumption among care providers that older patients are more eager to be informed. However, Schover *et al.* found that individuals <28 years of age are more often concerned that their treatment had interfered with fertility [9]. From the literature it can be concluded that in childhood survivors at least part of the poor recall is due to the non-provision of information by healthcare workers. An important other factor can be turmoil of unexpected events in the first weeks of illness in the case of a childhood malignancy. Parents are often overloaded with new information on subjects they are not accustomed with. It is quite probable that information is not comprehended or adequately processed and lost in such a situation. For adult cancer patients a deficient memorization has been described. They need longer intervals to recall memories, which is even

more pronounced in patients developing a cancer-related acute stress disorder [12].

In most patients, a relapse is not foreseen and there is no reason why at initial diagnosis these families did get less information. Such an event induced additional stress and augments probably deficient memorization in parents, which might explain our observation why recall of fertility information is lower than in non-relapsed patients in our study.

In the literature another phenomenon on provision of information in childhood cancer survivors may be the withholding of information in order to shield their child from information that might become a burden later on or in order to escape/fearing the reactions of the child. As such the findings of Burns *et al.* are interesting. They found that in 46 families with a female adolescent cancer survivor 69% of adolescent survivors and 49% of parents recalled someone talking about treatment effects and fertility (not statistically different). They further indicate a high concordance between parents and patients with respect to knowledge [13]. Based on similarity of our parent data and cancer survivor data in the literature; it is not likely that shielding is a major factor. Since we have no data on the knowledge of the patients themselves and did not ask for the awareness of shielding in parents we cannot make specific statements on this issue. Probably poor memorization, influenced to some extent by the heightened anxiety at diagnosis and initiation of treatment and selective provision of information by the care takers are main causes of limited knowledge in parents in the literature reports. Although all our patients did have information in print its value might be rather limited in case no (additional oral) information is provided or in case the oral information is not processed.

We found that treatment intensity influenced recall by parents. As such the earlier cited observation that provision of information by care takers depends on the estimated effects on the gonads might be explanatory in our cohort too. The finding that parents with pubertal boys could more often recall to be informed can be linked with the description that care takers think that older children and families are more concerned on fertility, which results in more extensive counseling [11]. One might conclude that in younger patients at diagnosis the information is less provided and less memorized. At a later moment, when the need for information emerges, the fertility issue is not addressed anymore by the healthcare providers.

Assumptions on actual fertility

Although no data on parents' assumptions are available in the literature, the parental uncertainty on fertility in 60% matches with reports on

cancer survivors. However, analysis of the various reports is difficult. Cohorts differ substantially in actual age and the age-related wish to have children, conceptions after cancer treatment, palette of diseases, social factors such as country-specific and ethnic differences. Another confounding factor within the reports is the conducting of semen analysis in some patients. Zebrack *et al.* stated that 19 out of 32 survivors were uncertain on fertility; mean age at diagnosis was 7.0 years, age at investigation was 24.2 years [7]. Schover *et al.* indicated that 44% of still childless survivors, diagnosed at a mean age of 26 years, perceived themselves as less fertile than peer groups [9]. Direct questioning of Hodgkin's disease survivors revealed that 60% of male and 44% of females doubted fertility. Unfortunately, it was not stated what type of chemotherapy and/or irradiation was given [14]. Large population-based studies on 125 000 adult survivors of childhood cancer in the US showed a 15% fertility deficit in survivors. For men a fertility rate of 76% was noted, whereas female survivors had approximately the same fertility rate as females, who did not had cancer [15]. In the cohort described by Langeveld *et al.*, 53% of men expressed their worries whether they can have children, for women 65% was found. For the controls, 29 and 55%, respectively, were reported [5]. The findings in our report on parents, i.e. 31% of parents expect normal fertility, 60% are uncertain on fertility and 9% expect absolute infertility seem to be a bit higher. However, these figures are still in line with data in the cited reports.

Conclusions

From our study we can conclude that only about half of the parents recalled information on future fertility in their sons. Lack of information (despite adequate written information) is caused by two main factors, i.e. limited oral information provision by the healthcare workers, by defective memorization and/or comprehension of parents. Our data are in line with the literature reports in survivors; so a high concordance between actual knowledge of parents and their son is likely. With respect to the expectance of future fertility only one-third of the parents assume that there is a normal fertility in their sons. Based on our findings it highly recommended checking at a moment parents have coped the problems and emotions at initial diagnosis or at relapse, whether they have adequate information on fertility. Discussions on the impact of cancer treatment on future fertility

should be repeated during follow-up visits during and after completion of therapy to assure satisfactory comprehension by both parents and patients.

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