

The legacy of sperm banking: how fertility monitoring and disposal of sperm are linked with views of cancer treatment

C. Eiser^{1,*}, E. Arden-Close¹, K. Morris², and A.A. Pacey²

¹Department of Psychology, University of Sheffield, Sheffield S10 2TP, UK ²The University of Sheffield, Academic Unit of Reproductive and Developmental Medicine, Level 4, The Jessop Wing, Tree Root Walk, Sheffield S10 2SF, UK

*Correspondence address. E-mail: c.eiser@sheffield.ac.uk

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BACKGROUND: Sperm banking is recommended for all men before cancer treatment, which carries a risk of long-term gonadal damage. However, relatively few men take up the offer. Among them, few attend for fertility monitoring or agree to sperm disposal where fertility recovers sperm banks are therefore burdened by long-term storage of samples that may not be needed for conception, with implications for healthcare resources. The aims here were to determine the views of men regarding personal benefits of sperm banking, and the advantages and disadvantages of fertility monitoring and disposal in the longer term.

METHODS: Semi-structured interviews were conducted with 19 men who were diagnosed with cancer and had banked sperm at least 5 years previously. Men were asked to recall their experiences from diagnosis to the present time, focusing on the consequences for their fertility. Interviews were transcribed and analysed using Interpretative Phenomenological Analysis.

RESULTS: Results are discussed in relation to decisions surrounding banking sperm, fertility monitoring and attitudes to disposal of banked sperm. Complex attitudes were identified, with men's views reflecting their understanding of their current and future fertility and the possible trajectory of cancer itself. Men are overwhelmed by information on diagnosis and fail to understand the implications of cancer treatment for their future fertility.

CONCLUSIONS: On diagnosis, men are given large amounts of information about cancer and treatment but fail to understand the longer-term implications of sperm banking. These implications need to be specifically addressed at subsequent appointments in order to optimize fertility monitoring and timely disposal of sperm samples.

Key words: cancer / semen cryopreservation / male infertility / psychology

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Introduction

Sperm banking is recommended for all males prior to cancer treatment where there is a risk of long-term gonadal damage (Royal College of Physicians, 2007). However, uptake is lower than expected given the incidence of cancer in men of reproductive age (Meseguer *et al.*, 2006), even in the UK where sperm banking is invariably provided free of charge (National Collaborating Centre for Women's and Children's Health, 2004).

Among those who do bank sperm, very few respond to invitations to review fertility (Tomlinson and Pacey, 2003) or attempt to use banked sperm in assisted reproduction techniques (ARTs) (Pacey, 2007) even though successful pregnancies have been achieved after sperm have been stored for 28 years (Feldschuh *et al.*, 2005).

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Banked sperm can be used in intrauterine insemination if post-thaw sperm quality is high, or IVF or ICSI if post-thaw sperm quality is poor (Wallace *et al.*, 2005; Pacey, 2007).

Previous reports and guidelines (National Collaborating Centre for Women's and Children's Health (2004) and Royal College of Physicians (2007) offer little guidance on the long-term management of men with banked sperm and provide no advice concerning the provision and frequency of post-treatment fertility testing (semen analysis). Regular semen analysis following cancer treatment might be considered good medical practice because it provides information about changes in fertility that can facilitate decisions about the appropriate use of contraception or expedite referral for ART. However, semen analysis now also fulfils an important part of the UK regulatory process.

115 In the UK, sperm can remain banked for a maximum of 55 years if
 consent is renewed every 10 years if 'significant or premature infertili-
 120 ty' is demonstrated (Human Fertilisation and Embryology Authority,
 2009). In practice, this means that where men cannot be contacted,
 or refuse to renew consent or return for fertility testing, banked
 sperm must be destroyed when consent expires. Hallak et al.
 (1998) found that the number of samples discarded is low (8–24%),
 usually following death or recovered fertility; and relatively few men
 agreed to elective disposal. Consequently, sperm banks are currently
 125 burdened by long-term storage of samples that may not be needed for
 conception, with considerable implications for healthcare resources.
 For all these reasons, questions have been raised about 'unnecessary'
 referral to the service (Magelssen et al., 2005).

Most previous work in this area has focused on men's decisions on
 whether or not to bank sperm on diagnosis of cancer (Achille et al.,
 130 2006; Chapple et al., 2007; Wilkes et al., 2010). Evidence suggests
 that men who are younger, better educated and childless (Schover
 et al., 2002), single (Girasole et al., 2006) and optimistic (Achille
 et al., 2006) are more likely to bank sperm. Banking has been associ-
 ated with positive emotional functioning in the face of cancer diagnosis
 135 (Saito et al., 2005). Fears that banking might delay life-saving treatment
 (Schover et al., 1999) and worries about abnormalities in children born
 from frozen sperm (Lass et al., 2001) have been cited as reasons why
 men decline. While contributing to our understanding of why men
 agree or refuse to bank sperm, this research offers little insight into
 140 the subsequent decisions about fertility monitoring or sperm disposal
 in the longer term, yet for those in charge of sperm banks, it is equally
 important to understand the latter decisions.

In this paper, we describe a preliminary study to further our under-
 standing of men's decisions surrounding banking sperm and specifically
 145 their subsequent views concerning fertility monitoring and sperm dis-
 posal. This was prompted by the growing size of sperm banks, the
 management costs associated with running them and the recent
 changes to the UK regulatory framework (Human Fertilisation and
 Embryology Authority, 2009), which gives increasing importance to
 150 fertility monitoring. These longer-term decisions are much less well
 understood compared with those made on diagnosis, even though
 they have considerable consequences for the men themselves, their
 families and delivery of care.

155 **Materials and Methods**

Recruitment and sample

Forty-four patients were invited to participate by post, and a further 15
 160 when attending a routine appointment at the sperm bank for fertility
 testing. In our practice, patients are sent a letter every 2 years to invite
 them to attend for fertility testing/monitoring (semen analysis), renew
 their consent or give permission for disposal of banked samples. Men
 were sequentially selected from those who responded to this letter
 during the July 2008 to September 2010 period. Each patient was provided
 165 with an information sheet about the study and asked to sign and return a
 consent form in a pre-paid envelope if they were interested in partici-
 pating. The Trent Research Ethics Committee (Ref: 07/H0405/61) approved
 all recruitment procedures.

As recommended in conducting qualitative research, we aimed to
 170 achieve sample diversification (Laperrière, 1997): a representative
 sample of cancer patients at different stages of the disease and recovery.

We therefore adopted broad inclusion criteria, including: (i) currently aged
 18–55 years; (ii) sperm banked prior to gonadotoxic treatment for cancer;
 (iii) sperm in storage for more than 5 years; (iv) no known mental health
 problems and (v) English language competence sufficient to be
 175 interviewed.

Of the 59 patients approached, 26 (45%) agreed to take part and inter-
 views were subsequently arranged by telephone. However, analysis
 suggested that no new information emerged following the initial 19 inter-
 views and it was therefore assumed that data saturation had been reached
 180 at this stage.

Data collection and analysis

Semi-structured interviews explored men's experiences leading up to the
 diagnosis of cancer, and their understanding of cancer treatment and its
 impact on their fertility. The interviews were organized around the follow-
 185 ing topics: (i) recall of banking sperm on diagnosis; (ii) follow-up after treat-
 ment, (including fertility monitoring and experience of attending Oncology
 follow-up) and (iii) attitudes to disposal of stored samples. Interviews were
 conducted by trained interviewers (E.A.C. and C.E.), and took place in
 participants' homes ($n = 15$) or the university ($n = 4$).
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Interviews lasted on average 60 min and were audio-taped, transcribed
 verbatim and analysed using interpretive phenomenological analysis (IPA)
 (Smith et al., 2009). IPA was developed specifically to elicit an individual's
 subjective experience and the associated cognitions and emotions of an
 experience of importance. IPA is a data-driven analysis that facilitates
 195 identification of themes within and across interviews.

Six transcripts were independently coded by two researchers and differ-
 ences resolved by discussion. This enabled the coders to address any
 inconsistencies at an early stage in the analysis and establish a robust
 coding frame. The remainder ($n = 13$) of the interviews were coded by
 one researcher and checked by the second coder ($n = 6$).
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Results

Demographic and disease-related characteristics of the men inter-
 viewed are reported in Table I and fertility-related and follow-up
 205 characteristics in Table II. The analysis of the interviews is organized
 around three main themes: (i) decisions surrounding banking sperm;
 (ii) fertility monitoring and (iii) attitudes to disposal of banked
 sperm. Each included a number of subthemes. Examples of comments
 from patients for each theme and subtheme are given in Table III.
 210

Decisions surrounding banking sperm

Men discussed their decisions about banking in relation to five sub-
 215 themes: *experiences prior to diagnosis, information on diagnosis, future fer-*
tility, family support and role of the oncologist.

Men's views about banking sperm need to be seen against the back-
 ground of their *experiences prior to diagnosis*. For many, there was a
 long period of uncertainty before the diagnosis either because men
 themselves failed to take symptoms seriously or because doctors
 were unable to confirm the diagnosis. In these cases, a cancer diagno-
 220 sis, even though it was frightening, suggested a course of action and
 possible cure. Given the protracted diagnosis, it should not be surpris-
 ing that men were often reluctant to bank sperm before beginning
 treatment. They wanted to start treatment as soon as possible and
 were concerned that banking would result in unnecessary delay,
 225 with adverse implications for survival.

Most men were overwhelmed by the amount of *information on diag-*
nosis. This inevitably focused on cancer and the proposed treatment

Table I Demographic and disease-related characteristics of the participating men (n = 19) who were diagnosed with cancer.

Participant characteristics	
Age at diagnosis (mean, range)	27.8 (15–41 years)
Age at interview (mean, range)	36 (22–40 years)
Time since sperm banking in years (mean, range)	8.3 (5–13 years)
Diagnosis	
Testicular cancer	7 (38%)
Hodgkin's lymphoma	5 (26%)
Non-Hodgkin's lymphoma	1 (5%)
Leukaemia	5 (26%)
Ewing's Sarcoma	1 (5%)
Marital status	
Married/living with partner	16 (84%)
Partner but not living together	2 (11%)
Single	1 (5%)
Qualifications	
None/secondary school certificates	8 (42%)
University degree	11 (58%)
Employment status	
Work full-time	13 (68%)
Work part-time/student	2 (11%)
Homemaker/unemployed/on sick leave	4 (21%)

Table II Fertility-related and follow-up characteristics of participants.

Participant characteristics	
Number of times attended Andrology clinic (mean, range)	2.5 (1–6)
Current fertility (based on WHO, 1999 classification)	
Fertile	6 (32%)
Subfertile	6 (32%)
Azoospermic	7 (37%)
Attempted ART after treatment	7 (37%)
Currently have children	
Conceived naturally pre-diagnosis	4 (21%)
Conceived naturally post-treatment	1 (5%)
Conceived through ART	3 (16%)
Adopted children	1 (5%)
Children with donor sperm	1 (5%)
Agreed to dispose of banked sperm	5 (26%)
Currently attending Oncology follow-up	12 (63%)

WHO, World Health Organization; ART, assisted reproduction techniques.

of fertility: for these men, banking sperm provided a safety net, an assurance of a 'normal life' following treatment.

The decision to bank sperm was sometimes facilitated by partners or parents and, in the case of the youngest patients, their fathers, indicating the importance of *family support* but all emphasized the *role of the oncologist* in providing information. The oncologist was also vital since they were in a position to facilitate appointments and ensure that sperm banking did not delay the overall treatment plan. Men accepted the oncologist's advice and kept appointments at the sperm bank in the same way as they kept appointments for other aspects of their treatment care plan, such as blood tests and scans.

Without this very practical support, many would not have organized sperm banking themselves. An over-riding theme in all interviews was the extent to which men went along with whatever they were advised to do. At the same time, they lacked any clear understanding about how cancer treatment might affect their fertility and therefore the potential importance of sperm banking. Furthermore, they did not appreciate how their fertility might change in the future, how they would set about using banked sperm if necessary, or critically their obligation to make subsequent decisions about fertility monitoring and ongoing sperm storage and disposal.

Fertility monitoring

All men interviewed had attended for semen analysis at least once (Table II), usually when they were establishing a new relationship or planning to start a family. Men were divided as to whether they saw fertility monitoring as an *intrusion into everyday life*, and non-attendance was often a result of *anxiety about current fertility*. Others saw fertility monitoring as an *opportunity* much as they did *oncology follow-up*. For all men, information about recovered fertility was very important, not least because it contributed to feelings of restored masculinity.

For many, post-treatment fertility monitoring was not seen to be important, partly because they did not realize that fertility could recover after treatment ends. Consequently, it was simply an *intrusion into everyday life*, a lot of bother for no real purpose and a reminder of past illness. Men felt uneasy about telling others they were attending fertility monitoring and were reluctant to ask employers for time off work. Some described not liking the jokes and suggestions of compromised masculinity that typically followed explaining to others.

The most common reason for non-attendance was *anxiety about current fertility*. Others wanted to 'give something back' to the hospital: they attributed their survival to medical experience accrued through treatment of previous patients and wanted to contribute themselves to better care in the future by attending when asked. The presence of a parent/partner was important, or they came because they wanted to talk through the implications of disposal. Men chose not to attend rather than be told their fertility was sub-optimal.

Others saw fertility monitoring as an *opportunity* with the hope for reassurance, much as they did for *oncology follow-up*. Oncology follow-up was seen to be more valuable by all although attitudes to attendance were complex (feelings that appointments were more beneficial for medical professionals than men themselves, guilt at taking up time that could be better spent with newly diagnosed patients, dislike of being reminded of their illness) but these negative emotions were never a barrier to attendance. Even 'bad news' at

and, as a result, men were often unclear about the implications of treatment for their *future fertility*. Half of the men in this study recalled being very pessimistic on diagnosis about the chances of any recovery

Table III Descriptions of individual themes used in the analysis [patient reference number, age (years) at sperm banking] and examples of comments made by participants.

	(i) Decisions surrounding banking sperm	
345	Experiences prior to diagnosis	I think what it is when you're first diagnosed your world falls apart. You can't think of anything but that and then because you don't know how bad it's going to be and after that you have a number of tests. Because initially they said a bit of radiotherapy on your neck and you'll probably be alright. Then they found it on my chest and round my stomach and then it goes from a bit of radiotherapy to chemo. So through that time it is obviously quite difficult and you don't know what's going to come next. What they're going to find next. You don't know anything about the treatment. But then once it gets to kind of the bottom when they have diagnosed it completely then they start talking about the treatment and you know you start feeling better because you feel as though you're actually recovering doing something about curing it as opposed to it's been diagnosed and not having any treatment but just finding out that things are getting worse and worse and worse. (01,35)
350	Information on diagnosis	I didn't really put 2 and 2 together no. And I suppose I didn't till after, even afterwards I didn't realize what affect it would have. I'm sure they must have explained it but whether I'd got too much on or whether I just didn't understand or whether I just didn't realize, I don't know. (03,33)
355	Future fertility	I mean one of the things I regret was the sort of erm . . . my attitude that I will never have children again. Whether it wasn't explained to me ever good enough or I just didn't listen when I was told but the whole situation whereby my sperm count could improve naturally anyway, I didn't really ever have that in my mind. So in terms of using contraception and that sort of thing that was something I was probably quite ignorant about. (20,30)
360	Family support	I didn't want to do it at all. Just because I didn't want to go through the process, just because I was so embarrassed basically. But my dad forced me to, well not physically forced me to but just said come on you've got to do it. Extremely embarrassed about that concept in front of my parents. (04,14)
365		I can remember sort of when I then got dropped off and knew for sure sort of meeting down the street and seeing her coming up and you know sort of telling her straight away. I think [my partner] was prepared in that way so it wasn't quite a shock where suddenly she was very upset. I think she'd sort of steeled herself to that and I think she'd decided that she would play the very positive role to try and support me you know to say that it would all be alright and you know we'd get through the treatment and things like that, together. (13,25)
370	Role of the oncologist	There wasn't really the time, it was sort of, I don't know how long before possibly, from being diagnosed it was maybe, it wasn't the following day it would probably be the day after, so I think within a couple of days they'd arranged for me to go and give a sample because obviously I was anaemic and I was so poorly they wanted to get on with the treatment as quickly as possible, so it was over a couple of days so I don't think there was the time really to speak, it was never, it was never a decision really, it was automatic. (07,18)
	(ii) Fertility monitoring	
375	Intrusion into everyday life	Oh yeah I'll go to that, left it on the side anyway four weeks went by and I thought I haven't got time to do that, I'll leave it which were bad of me I admit, but again, I've got a busy life and I've got a job to do and you know it wasn't the most pressing thing on my mind. Don't know what changed my mind this time, like I say I wanted to know for my own piece of mind to see whether or not my fertility had dropped or it had improved, that type of thing, so that's why I went in this time. (09,21)
380	Anxiety about current fertility	I think deep in the back of my mind I always at least hoped that it would come back and you can kind of see from the pattern of my kind of . . . I went back and had my fertility tested quite a few times probably 3, 4 years after my chemo in the kind of hope that it would come back and then kind of gave up. (09,21)
385	Opportunity	I would like to get to the point one day where you wouldn't need or you wouldn't have to need the sperm in storage, you know that eventually it would come back naturally on its own. So you wouldn't need to go through the assisted conception treatment. In terms, for me, I've always been interested in going back and I think more so recently because we were looking at starting at family, that there's was always the option that can we try naturally rather than have to go back and go through the treatment. So it's been more of an interest to go and find out more off my own back than probably being nudged by the hospital saying a year's passed do you want to come back and see if there's any change. (01,18)
390	Oncology follow-up	I like the reassurance and that I know I can go in 3 months time. I can say to someone 'I'm a bit worried about this' or 'can you just check the scar'. Its nice to have that contact. Its almost like you need that momentum that bit of contact serves to keep you going and ticking over.' cos you worry you know? oh its come back. So its nice to have the contact. (15,23)
395	Feelings of masculinity	In terms of being infertile I think there's an effect there that probably, maybe not feel less of a man, but when you see either different, not comedy sketches or different references to being infertile, you kind of silently not feel that that's aimed at you but there's that kind of thought, it's almost that that's me but nobody knows about it. So I think you'd probably feel more masculine if I was more fertile. I think it's something I've never really thought about in that sense, I don't feel totally alienated because I'm infertile but I think subconsciously somewhere there's always that thought. (19,21)
	(iii) Attitudes to disposal	
400	Fear of disease recurrence	I much prefer the idea of it being kept indefinitely. I think it's a security blanket thing and I sort of relate it back to like going for the follow up appointments. Actually when they turned round and said this is your last appointment, we won't need to see you again, you actually felt quite . . . you felt a little bit concerned and worried about that cos you know it was sort of a security blanket and you were going back each year and you know you felt like it was being watched and I think that's the same with the sperm sample. Even though there's no really rational reason for keeping sperm samples that are not probably quite as good as the quality of what you're producing now it's a security blanket and it sort of re-assures you and makes you feel a bit more secure I suppose and crudely thinking as well, well if something unexpected happened to me quickly, if I died, for you know whatever, obviously there's no cost to me to keep it indefinitely, it's a resource issue for the andrology people. (13,25)

Continued

Table III Continued

460	Psychological benefits	I think the main thing I would sum up with is that the point that I've reached now, having been through cancer treatment, IVF, banking sperm and so, I've reached a very positive frame of mind where I can see all those experiences as very meaningful but have reached the point where I do not want to use the banked sperm any more so that has perhaps become something that I'm going to leave behind now. (15,23)	515
465	Fate of banked samples	Well obviously next of kin. If she wanted to. If she didn't then she could cancel it if you know what I mean. It would have been her decision anyway In a few years time she might meet somebody else, marry and have kids with them and then it's a whole new life. Even though it's the life she's had before she's not experienced having kids with that person. And in a way I suppose it's not luggage in a way because whereas if I was poorly and you'd got that chance to have them if they pass away, a bit like that Diane Blood woman, then she's got that option then. She can do it if she wants. But then she can say well hang about he's gone I want to have a fresh start, cancel them. Because nobody else is going to get to use them. (14,25)	520
			525

470 oncology follow-up had some compensation (early detection might
lead to better outcomes). Men realized that 'bad news' about fertility
carried no such possibilities. Information about recovered fertility was
welcome even among men who did not want any more children, since
475 it restored *feelings of masculinity* and enabled them 'to draw a line'
under the whole illness experience.

Attitudes to disposal

480 The most common argument used to justify continued storage was
fear of disease recurrence, although there were *psychological benefits*
for those who were able to agree to disposal and put the illness
experience in perspective. Men also discussed the *fate of banked*
samples.

485 Five men had agreed to dispose of their banked sperm by the time
of this study; three because their fertility had recovered, one had
adopted children and one because he believed his banked sperm
was too poor to use in ART. The remaining 14 men (including
fertile and infertile men) were undecided about whether or not to
490 agree to disposal.

Decisions about disposal were complex and unresolved but often
centred around *fear of disease recurrence*. Typically, where fertility
had recovered, men saw stored samples as a psychological protection
against fertility decline in the event of future disease; for these men,
495 disposal would amount to 'tempting fate'. Some men who were cur-
rently subfertile or azoospermic thought that they would agree to dis-
posal if their fertility recovered but were not prepared to do this
prematurely. There were definite *psychological benefits* for those who
were able to take the decision that stored samples were not
500 needed. These men were able to put the whole cancer experience
behind them and 'move on'.

In contrast to the complexity surrounding decisions about sperm
disposal, many men found it relatively easy to decide about the *fate*
of banked samples in the event of their death or mental incapacity,
505 in that they were content to leave the sample for their partner and
allow her to make the decision. Difficulties arose for those who did
not have a partner or had separated from the person who they had
initially named on the consent form. In these cases, they were con-
cerned that samples might be used against their wishes. Others who
510 were concerned about cancer recurrence and premature death
were prepared for their samples to be destroyed, as they did not
want their children to grow up without a father. Three men were
also willing for their sperm to be used for research.

Discussion

Our results extend previous work focusing on the decision to bank
sperm on diagnosis of cancer to include attitudes towards fertility
530 monitoring and disposal of banked sperm in the longer term.

The barriers that men experience on diagnosis that might account
for the relatively low uptake of sperm banking have been described
previously, and include anxiety to initiate treatment as soon as possi-
535 ble, given fears that delays could compromise treatment efficacy
(Chapple *et al.*, 2007). This anxiety was common among all those
who took part in this study but our data suggest that the wish to
begin treatment as soon as possible is partly a consequence of the
relatively long period of illness and anxiety before diagnosis. In this
540 context, the wish to simply get on with treatment rather than worry
about future fertility is understandable.

Most men described how, prior to banking sperm, oncologists
initiated discussions about the possibility of compromised fertility
and the options available. However, the oncologists not only provided
545 information but also facilitated and co-ordinated appointments with
the sperm bank. The oncologist did not simply recommend sperm
banking; they assumed responsibility for most aspects of organization.
The presence of a parent or partner was also invaluable. This cor-
roborates the findings of Achille *et al.* (2006) and might suggest that
550 single men, or those who attend Oncology alone, may need more sen-
sitive counselling and professional support.

On diagnosis of cancer, men in our study were focused on treatment
and recovery rather than whether or not they might want children in the
future, with considerable implications for how they engage with post-
555 treatment fertility monitoring programmes. The low take-up of post-
treatment fertility monitoring has previously been attributed to men's
reluctance to know the state of their fertility (Wasserman *et al.*,
1987; Chapple *et al.*, 2007) and our data also suggest that news of
poor semen quality post-treatment is distressing, even where sperm
560 of adequate quality has been banked. However, men were largely
unaware that fertility may recover after cancer treatment and therefore
saw little reason to attend for semen analysis. The probability of rec-
overing spermatogenesis post-treatment is largely disease- and
treatment-specific. Over 60% of those who banked sperm can show
565 some sperm production after 3 years follow-up (Bahadur *et al.*,
2005). Such information needs to be explained more carefully to men
as this may help them to engage in the process of fertility monitoring.

All those interviewed were anxious about attending fertility moni-
570 toring for fear of being told their fertility was poor. It might seem

that men are unconcerned about their fertility and not interested in keeping appointments, but we suggest instead that they harbour real fears about fertility loss, partly because the results of semen analysis were often an integral part of men's assessment of their general health and recovery from cancer.

The question of disposal of banked sperm was highly complex. Those whose fertility had recovered were often reluctant to dispose of sperm even when they considered their families complete. This was related in part to fear of disease recurrence and knowledge that this could lead to renewed fertility loss. This wish to keep samples in storage was strong and overrode an awareness of the resource implications of doing so.

Men's concerns about sperm disposal share some similarities with the views of couples who struggle to know what to do with cryopreserved embryos that remain at the end of IVF treatment (Provoost et al., 2009). Frozen embryos have been viewed as: (i) biological tissue; (ii) virtual children with interests in need of protection and nurturing; (iii) siblings of living children and (iv) genetic or psychological insurance policies and symbolic reminders of past infertility (Newton et al., 2007), perhaps with different implications for decisions about disposal. This work, suggesting why individuals may find decisions to dispose of embryos to be difficult, may provide important insights into why men are reluctant to dispose of banked sperm, even when it is no longer useful.

Limitations

Qualitative research is often criticized given the small samples typically recruited and reliability of the data analysis; both have implications for the generalizability of results. To address this, we followed key criteria for quality qualitative work (Smith, 2011) and these included recruitment of a sample including a wide age-range, differing in the number of previous children and frequency of attending clinic. However, there is a bias in our sample, especially towards more educated men who presumably had more flexibility in their work to arrange appointments and perhaps felt more comfortable discussing these issues with a researcher.

As in any research study, our results are dependent on the experiences of those men who agreed to take part. There may be many reasons why men chose not to take part in this study (e.g. work commitments, no current concerns about fertility) and it has been noted previously that many men fail to maintain contact with the sperm bank in the years following banking (Tomlinson and Pacey, 2003). It is important to obtain the views of these men as this may increase our understanding of why many samples are stored needlessly (and expensively for the Health Service).

Interviews were conducted with men from a single sperm bank located within easy reach of the local cancer hospital, where most oncologists were well informed and positive towards sperm banking. However, some oncologists may be more reluctant than others to discuss sperm banking (Schover et al., 2002) and it is possible that our results reflect the unique arrangements in Sheffield Teaching Hospitals, and need to be confirmed elsewhere.

Finally, the quality of this kind of work is dependent on the skills of the interviewer (Smith, 2011) and it might be argued that the discussion of male fertility would be most successful when conducted by male interviewers. However, there is evidence that female

interviewers create conditions that are more conducive to disclosure, and are perceived as more sympathetic than male interviewers (Pollner, 1998). In practice, all the interviews were lengthy and involved, and there was no suggestion that men felt compromised by female interviewers. Efforts were made to ensure the reliability of the data, in that two researchers with experience of the method agreed on the definition of themes.

Our results are limited to understanding men's views about fertility preservation and may not be relevant to women who are faced with cancer treatment. Such issues of reduced fertility also confront women, although routine egg preservation has only become available comparatively recently (Gosden, 2005), meaning that less is known about female attitudes to fertility preservation. The procedures associated with embryo and oocyte cryopreservation can take several weeks, which may lead to a significant delay in cancer therapy and potentially a problem for those with advanced-stage cancers (West et al., 2009). Evidence currently available suggests that young women are interested in options to help preserve fertility during cancer treatments but, like men, they are not willing to postpone treatment for this purpose (Burns et al., 2006). In the future, it may be helpful to conduct research that addresses differences between men and women in the value they place on fertility preservation prior to beginning cancer treatment.

Clinical implications

When banking sperm, men routinely described how the oncologist was central to information-giving and facilitated the whole process of banking. Men in this study, who had all banked sperm on diagnosis, appreciated that sperm banking was made easy for them in that the oncology department organized many appointments. As such they described how they simply went along with routine clinical advice rather than spent time weighing up the pros and cons of banking. The implication might be that where, for whatever reason, there is poor communication between Oncology and the sperm bank, or physical separation between departments, men may be less likely to bank, irrespective of their own beliefs or wish for children in the future. Previous research also suggests that oncologists vary in their views about the value of sperm banking and the extent to which they are prepared to, or confident about, discussing this with men (Quinn et al., 2009).

Given that oncology departments organize sperm banking and that men are given so much information on diagnosis, it is not surprising that they fail to understand why they are banking sperm or how this might affect their future. Consequently, men often had little information about the advantages of routine fertility monitoring, the probability of their fertility recovering or an understanding of the options for conception using banked samples. Men in our study reported being overwhelmed by the amount of information given on diagnosis, much of which was not fully assimilated. It is clear that they typically did not fully understand how fertility might be affected by cancer treatment, the likely course of any fertility recovery, or implications for use of stored samples in the event of their death. Provision therefore needs to be made for more detailed discussions about the longer-term implications of sperm storage, after men have recovered from the initial trauma of diagnosis and understanding cancer treatment. The optimum timing and approach for this needs to be established

685 but discussions could take place as an integral part of any formal discharge from Oncology.

The ability to reproduce is central to heterosexual masculine identity (Gurevich *et al.*, 2004) and is especially important when there is a threat to life (Fritsche *et al.*, 2007). Opportunities to bank sperm 690 where fertility is challenged by cancer or its treatment therefore potentially offer men significant improvements in quality of life. As questions are raised about the costs involved in keeping sperm banked, it is essential to understand men's apparent reticence to be involved in fertility monitoring or agree to disposal. This reticence 695 may reflect men's well-documented lack of interest in health care (White and Banks, 2004) and health-related research (Moynihan, QI 1998). We would argue more than this: such reticence is related to complex fears about compromised fertility and what this might indicate about disease recurrence.

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Authors' roles

A.A.P. and C.E. designed the stud and were equally responsible for the conception and drafting of the paper. K.M. was responsible for patient 705 recruitment and collection of medical data. E.A.C. and C.E. conducted the interviews and analysed the data. E.A.C. prepared the first draft of the paper and A.A.P. and C.E. were responsible for final manuscript that was approved by all authors.

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Conflict of interest

None declared.

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