Sperm storage for cancer patients in the UK: a review of current practice

Vinay Sharma*

The Leeds Centre for Reproductive Medicine, Seacroft Hospital, Leeds LS146UH, UK

*Correspondence address. E-mail: vinay.sharma@leedsth.nhs.uk

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ABSTRACT: An increasing number of cancer patients can now hope to have a full and normal life due to significant improvements in treatment outcomes and survival rates. The application of cryobiology to store fertile gametes before sterilizing treatments has been a natural progression. Greater awareness has markedly increased the worldwide demand for long-term storage of sperm, and has prompted the UK Human Fertilization and Embryology Authority to extend the period of storage permitted by their regulations to 55 years. Other patients undergoing sterilizing chemotherapy and/or radiotherapy such as haemoglobinopathies requiring bone marrow transplantation and autoimmune disorders such as rheumatoid arthritis may further increase the indications for sperm storage. Most adult and adolescent patients and their relatives/spouses/parents/guardians value this service even though very few eventually use the sperm. There is an urgent need to develop national and international guidelines for the provision, organization, maintenance and management of the cryopreservation services.

Key words: sperm banking / sperm storage / storing fertility / sperm freezing

Introduction

It has been known for centuries that cryopreservation technology allows preservation of cells and tissues without change in their function or genetic information. Although the first observations on the effects of freezing temperatures on human sperm were made in 1776, it was another hundred years before the establishment of the first bank for frozen human semen (1886). By 1938, sperm survival at very low temperatures (−269°C) and successful storage at −79°C was known. The first successful human pregnancy using cryopreserved sperm was reported by Prof. Sherman in 1953, commercial cryobanks for donated sperm have existed since 1972, and the first normal child with cryopreserved donated sperm was born in 1973 (Sherman, 1980) and the longest duration of cryo-storage of sperm before live birth is 21 years (Planer News and Press Releases, 2011). More recently application of vitrification technology, which avoids intra-cellular ice formation, has reduced cellular stresses such that freeze thaw survival of gametes and embryos is substantially higher (Expert Review of Medical devices, 2008).

Awareness of the service

Guidelines from the National Institute for Health and Clinical Excellence state that any men or adolescent boys should be offered the opportunity to store their sperm if they are receiving treatment that may render them infertile. Yet a recent survey of nearly 500 haematologists and oncologists in the UK found that 21% were not aware of any local policies on sperm banking. Even though most clinicians recognized this to be an integral role of their service, only 26% of oncologists and 38% of haematologists systematically documented discussions about sperm banking with male cancer patients (Gilbert et al., 2010). This trend is being reversed and consequently the demand for this service is increasing rapidly, especially with in the National Health Service (NHS).

Purpose of the survey

Even though awareness and utilization of local sperm cryopreservation services have progressively risen, there are no national guidelines regarding provision of such services or policies to manage the ever increasing volume of stored sperm.

A survey was conducted to record local practice in 2009–2010 and to help in developing a consensus between neighbouring centres regarding the most important management issues so as to decrease geographical variations in the service. Moreover, we hope that this exercise will also stimulate the development of a national guideline for primary care trusts, cancer service providers and fertility units alike. Similar exercises in other developed countries with NHSs would enable a still wider consensus in development of management policies and practices.

Background

Service demand

This paper limits itself to assessing the demand in cancer patients. There are however several other groups undergoing sterilizing...
chemotherapy and/or radiotherapy that may have the same entitlement for storing fertility as the cancer patients. For example, autoimmune disorders (e.g. rheumatoid arthritis and Wegner’s Granulomatosis) and haemoglobinopathies requiring bone marrow transplantation (e.g. thalassaemia and sickle cell anaemia requiring both total body irradiation dose \(>1000\) cGy & chemotherapy).

Among adults (25–49 year age group)

In the 30-year period between 1979 and 2008, the European age-standardized mortality rates for all malignancies fell by a fifth from 219 to 176 per 100,000 population (Northern Ireland Statistics and Research Agency Registrar General Annual report, 2009; General Register Office for Scotland, 2010; Office of National Statistics, 2010). In the UK, during 2007, 297,991 people were diagnosed with cancer (Cancer Research UK website). Cancers predominantly occur in \(>60\)-year-old patients (75%) and \(<1\%\) occur in children (0–14 years). However, around 1 in 10 of all cancer occurs in reproductive age group adults between 25 and 49 years (Cancer Research UK website).

Of the 15 most commonly diagnosed cancers in men, testicular cancer has the highest 5-year relative survival at 96%. In women, breast cancer, malignant melanoma and cancer of the uterus all have 5-year relative survival of over 70% (Cancer Research UK website). Over the past 10 years (1999–2008), the age-standardized mortality rates for all malignant neoplasms fell by 9%—around 12% for men and 8% for women. Overall, the male cancer mortality rate has decreased more quickly, by a 25 versus 12%, respectively since 1996 to 2000 was 73% (Gustafsson et al., 2000; Sankila et al., 2000; Gatta et al., 2003; Sankila et al., 2006; Stiller, 2007; Northern Ireland Statistics and Research Agency Registrar General Annual report, 2009; General Register Office for Scotland, 2010; Office of National Statistics, 2010; Cancer Research UK website).

Among teenagers and adolescents (15–24 years) and children

In 2007, 1892 UK teenagers and young adults (15–24 years) were diagnosed with cancer commonly Hodgkin lymphoma, testicular cancer, malignant melanoma and leukaemia. Additionally 1367 cases of cancer were diagnosed in \(<15\) year olds, with a slightly higher incidence in boys than girls and the majority had leukaemias. These days \(>75\%\) children survive cancer as opposed to only 25% in 1960s. Almost 80% children with kidney cancer and 60% with neuroblastoma can now expect a complete cure.

In the UK, from 2005 to 2007, 819 (boys) and 672 (girls) were diagnosed with cancer, which provides for a rate per 100,000 population of 153.2 in boys, 133.0 in girls and a combined rate of 143.4. The 5-year survival rate for patients diagnosed from 2001 to 2005, in the UK was 78% and 10 year survival rate for patients diagnosed from 1996 to 2000 was 73% (Gustafsson et al., 2000; Gatta et al., 2003; Sankila et al., 2006; Stiller, 2007; Northern Ireland Statistics and Research Agency Registrar General Annual report, 2009; General Register Office for Scotland, 2010; Office of National Statistics, 2010; Cancer Research UK website).

Estimated total

From the earlier-mentioned prevalence, it can be reasonably estimated that annually around 29,799 men and women in the reproductive age group, as well as 1892 teenagers and adolescents may merit consideration of and/or preservation of fertility.

Of the total 31,691 patients in the UK, as a rough estimate, around 15–16,000 will be men whose time permitting may be considered for freezing of sperm. This estimate does not include storage of testicular tissue in children for newer developments on the horizon where fertility can be restored after puberty or when needed (Brinster, 2007; Keros et al., 2007).

The legal framework

In the UK, persons over the age of 16 years can provide a ‘legally valid’ consent to treatment provided they are competent and able to make an ‘informed and wise’ decision [Family Law reform Act 1969 s8; Age of legal capacity (Scotland) act, 1991 s2, (4); Alderson, 2000; Hedley, 2000]. The field of Assisted Reproduction including procurement, processing, transportation, storage, use and donation of gametes or embryos is governed by statute by the Human Fertilization and Embryology Act 1990 and is regulated by the Human Fertilization and Embryology Authority (HFEA) (Code of Practice (version 8), 2010). There is a statutory requirement for informed consent and unlike other areas for minors, substituted consent is specifically excluded. This requirement is a hindrance in genuine cases to freezing and utilization of genetic material for minors (e.g. testicular and ovarian tissue) and there may be further consideration under the UK Human Rights Act 1998 at some stage in the future. Procurement, processing, transportation and storage of all gonadal tissue will also have to meet the requirements of the EU Tissue Act regulated in the UK by the Human Tissue Authority (HTA) (Code of Practice (version 8), 2010).

The onus on obtaining an ‘informed and wise consent’ from the patient is an ‘absolute’ requirement before cryopreservation can be performed. The provider of the gametes retains the ‘right of control’ of their genetic material, the fate of which can be varied only with their written consent. If gametes are collected without proper consent, it may be considered an ‘assault’. The gametes or embryos can only be imported or exported to or from a centre outside the UK, but only with the provider(s) written consent to do so. The ovarian and testicular tissue, as cells of the germ line, fall outside the definition of gamete in the Human Fertilization and Embryology Act 1990 (as amended) and so are also subject to the same storage requirements as sperm and eggs (Code of Practice (version 8), 2010). Obtaining ‘informed and wise’ consent

If there is an intention to store gametes or embryos, the centre should provide information regarding the following (Code of Practice (version 8), 2010):

1. possible deterioration or loss of viability of gametes or embryos as a result of storage, handling, freezing, transportation and thawing.
2. the potential risk of cross-contamination between samples.
3. the regulations for statutory storage periods for gametes and embryos.
4. the regulations for extending storage periods including, in the case of embryos, the requirement for both gamete providers to consent to any extension of storage.
5. the likelihood of a live birth resulting from previously cryopreserved embryos or gametes.
6. the treatments that may be necessary.
7. the screening tests to be done.
8. the cost of these.
(9) the reason for them.
(10) the implications of the tests for the gamete providers.

For consent to be considered ‘legally valid’, the patient must be able to make an ‘informed and wise’ choice. This means they must have received appropriate information, and have had time to consider all available options and reflect on their implications, especially where delay to the start of cancer therapy is involved. Procurement and storage of gametes can only proceed once valid consent has been given.

If the storage took place before 1 August 1991, centres are not obliged to continue storage without a written consent and the law requires that such gametes cannot be used, unless the gamete provider becomes competent and consents to such use (Code of Practice (version 8), 2010).

The provider of gametes prior to storage needs to be aware of the options for ‘posthumous use’ or ‘if they become mentally incapacitated’. It is possible to register a deceased partner as the parent of desired children irrespective of whether they already had children (Oppenheim et al., 2005). The two centres in Scotland did not express their opinion probably because they had differing comment on the funding process.

**Survey results**

We undertook a survey of several regional centres in the UK but not all of those requested completed the questionnaire (Fig. 1). Of the 14 centres approached, 9 completed the questionnaire and 8 answered all of the questions asked. The results have been summarized in Tables I–VII. A number of recommendations have been proposed in the Supplementary material that could bring uniformity to practice and set the stage for future developments.

**Storage policies**

All respondent centres stored sperm for cancer patients prior to chemo and radiotherapy but had reservations about collecting sperm after chemotherapy had begun. Even though only sperm banks co-located with regional cancer services were surveyed, Table I demonstrates that the number of patients with banked samples varies extensively. All centres also agreed to store sperm for benign conditions that required sterilizing chemo or radiotherapy such as haemoglobinopathies before bone marrow transplantation or rheumatoid arthritis but this indication currently forms a very small unspecified proportion of total activity (Table I).

**Funding of the service**

Even though there is an NHS in the UK, there are wide variations in how the service is funded not only between England and Scotland but also between different regions in England. There was an equal amount of variation in who provided the funding, costs payable, whether approval for funding was provided from the outset and if so, for how long (Table II). Only three centres were funded on a ‘case-by-case basis’ and only two of these had an annual recurring charge for the ongoing expense of storage. There was also variation in centre’s opinions on whether funding approval should be available at referral with four stating it not to be necessary but also added that storage should be dependent on clinical need and may not be commenting on the funding process per se. The two centres in Scotland did not express their opinion probably because they had differing funding arrangements.

**Follow up of patients after storage**

As shown in Table III, there was variation in whether patients were followed up after storage and among those with a policy; there was
Storage policy
1. Do you store sperm for cancer patients prior to chemo and radiotherapy?
2. Do you store sperm for other benign conditions before chemotherapy such as Sickle cell anaemia, thalassaemia before BMT or rheumatoid arthritis requiring methotrexate?
3. Approximately how many patients have currently stored sperm in your facility? Would you store sperm after the patient has started chemotherapy?
4. If your answer to the Q 4 is Yes, are their specific circumstances conditions in which you would store or would you store always? Please specify.
5. If your answer to the Q 4 is No, what are your concerns? Please specify.

Funding
1. Do you have specific funding for storage of sperm?
2. If yes, is the funding from PCT or your local cancer network?
3. What is the funding at the time of storage?
4. For how many years do you get funding at the outset?
5. Do you obtain specific funding approval for each patient before you undertake storage?
6. If you obtain approval, who approves (YCN or equivalent body or PCT or patient)?
7. Do you think such funding approval must be obtained before storage?
8. What would you do if a patient is referred without funding approval, store or not store?

Follow Up of patients after storage
1. Do you see the patient again for fertility assessment after storage?
2. If yes, is it upon specific referral or a routine review?
3. Should it be a routine review or only after a routine referral?
4. Is this assessment done in your embryology labs or in another CPA accredited laboratory?
5. Where should it ideally be?

Management of storage capacity
1. Do you store for 55 years irrespective?
2. Do you think management of stored samples is essential?
3. If yes, what do you think should be done after 5 years of storage?
4. Do you keep annual postal contact with your patients?
5. How long do you think the sperm should be stored for patients who have been rendered azoospermic?
6. What do you think should happen if after 5 years patient has been found to have normal sperm analysis (WHO assessment)?
7. What do you think should happen after 5 years of storage if the patient has already fathered children?
8. What do you think should happen after 5 years if the patient is found to be suffering from OATS but has sperm in the sample?

Patient communication & Management of storage capacity
1. How do you ensure that patients are aware of their duty to maintain annual contact with the unit and inform of change of address or circumstance?
2. What do you do if the patient fails to respond to unit communications with in the first 5 years?
3. What do you think should happen after 5 years if the patient fails to respond to unit communications?

Figure 1 Questionnaire sent to the nine responding centres.

variation in how or when to review the patient. Only half of the centres had a Clinical Pathology Accreditation (CPA) accredited laboratory, while others worked through HFEA-licensed laboratory services. 

Management of storage capacity
All centres were unanimous in that an active policy was needed to manage storage capacity. However as summarized in Table IV, there
are significant variations between centres in how long the patient consented for storage in the first instance, when a review occurred and actions taken in differing clinical scenarios. All centres agreed that storage should continue in azoospermic men and sperm should perish only with patient’s written consent. However there were variations in policy followed after a relapse-free interval, in men who have children (pre-existing or since storage), where sperm analysis is normal or there has been partial gonadal toxicity with oligo-asthenospermia (OATS).

Patient information and communication
All centres have legal requirement (Code of Practice (version 8), 2010) to provide specific information, make efforts to stay in contact with patients and explain the importance of informing the centre of any change in their contact details. The centre is expected to inform patients before permitted storage period ends, provide information about all available options and enough notice for consideration. All centres provided verbal and some provide written information also. All centres asked patients to advise the centre of their change in address in writing but only some followed this up with a letter and a periodic postal contact as summarized in Tables IV and V. Similarly there were dissimilarities in when the patients were contacted, how far the centres went in tracing non-responding patients including contacting the patient’s general practitioner (GP), oncologist and/or the National Tracing Agency.

Circumstances in which stored sperm could be allowed to perish
As summarized in Table VI, other than expiry of the storage period, all centres said that sperm should be discarded only with patient’s written consent, except when sperm were non-viable on test-thaw or after the patient’s death when there was no provision for posthumous use. All centres wished to consider long-term prognosis for the patient with the oncologist, their age, fertility and family history before recommending discarding of the stored sperm. Some centres will maintain longer storage for men with OATS.

Advising patients regarding the cost of storage
As summarized in Table VII, most centres did not have any discussion regarding the cost of storage with the patients at the time of freezing. Only one of the nine centres advised the patients at the outset that primary care trust (PCT), responsible for funding this service may have time-limits and that they may have to pay the storage costs if and when this funding was withdrawn. Two centres said that NHS/PCT funding should be available and hence did not feel the need to discuss this subject with the patient. In the event of withdrawal of funding, most centres said that it was appropriate to allow patients to self-fund storage for longer if they wished.

Posthumous sperm storage
There is a need for guidance on how long the sperm should be stored after a patient’s death where the surviving spouse has been given permission for posthumous use of the stored sperm.
Miscellaneous issues

One centre expressed concern regarding the unfairness of national variations in NHS-funded storage and that without the guarantee of funded treatment. Other questions raised included:

(1) Could the sperm be stored after death for a spouse not specified at the time the sperm were collected for storage?
(2) Can patients that have signed for storage up to age of 55 on old consents, change consents to store for 55 years on new consents?

Table II Funding of the service.

<table>
<thead>
<tr>
<th>Availability of funding</th>
<th>8/9: some funding</th>
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<tbody>
<tr>
<td>1/9: no funding</td>
<td></td>
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<table>
<thead>
<tr>
<th>Nature of funding</th>
<th>4/9: ‘case-by-case’ basis</th>
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<tbody>
<tr>
<td>3/4 PCT funded</td>
<td></td>
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<tr>
<td>1/4 referring directorate funded</td>
<td></td>
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<tr>
<td>1/9: historical funding: untraceable within the directorate</td>
<td></td>
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<tr>
<td>1/9: fixed recharge from gynaecology to the oncology budget</td>
<td></td>
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<tr>
<td>1/9: funded by local health board in Scotland</td>
<td></td>
</tr>
<tr>
<td>1/9: no specific funding apart from the andrology budget</td>
<td></td>
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<tr>
<td>1/9: supported by local cancer charities</td>
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<table>
<thead>
<tr>
<th>Level of funding</th>
<th>1/9: fixed charge of £15,000 per annum</th>
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<tbody>
<tr>
<td>1/9: single one off charge for freezing sperm (£384) per patient</td>
<td></td>
</tr>
<tr>
<td>1/9: ‘case-by-case’ charge of £225 plus recurring annual charge £90</td>
<td></td>
</tr>
<tr>
<td>1/9: ‘case-by-case’ charge of £400 plus recurring annual charge £190</td>
<td></td>
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<tr>
<td>2/9: (Scottish centres): not specified</td>
<td></td>
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<tr>
<td>3/9: no specific funding or no comment</td>
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<tr>
<th>Duration of funding</th>
<th>4/9: funded for as clinically &amp; legally necessary</th>
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<tbody>
<tr>
<td>1/9: stores sperm for minimum 10 years</td>
<td></td>
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<tr>
<td>1/9: block cost per annum irrespective of the volume of activity</td>
<td></td>
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<tr>
<td>1/9: single one off charge for freezing; no ongoing support</td>
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<tr>
<td>2/9: no comment</td>
<td></td>
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<tr>
<th>Approval for funding</th>
<th>4/9: centres did not receive formal approval of funding at referral</th>
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</thead>
<tbody>
<tr>
<td>2/9: (Scottish centres) had annual funding arrangements</td>
<td></td>
</tr>
<tr>
<td>Among three centres funded on ‘case-by-case’ basis</td>
<td></td>
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<tr>
<td>1/3: received approval of funding with the referral</td>
<td></td>
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<tr>
<td>2/3: stored as per clinical need without formal funding approval</td>
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Discussion

There was unanimous agreement among respondent UK centres that storage of sperm should be considered for all patients when ‘at risk’ of sterility following chemo or radiotherapy. There was a significant heterogeneity in the number of samples stored in regional centres co-located with regional cancer services which may reflect awareness among professionals, provision of funding and other local policies. There were also differences between centres in how this service was funded. While there were models of good practice where there was ‘case-by-case’ funding and approval accompanied referral with active oncology directorate involvement in annual review etc., at the other end of the spectrum, there was no specific funding and services were funded either by andrology budgets or by cancer charities. Consequently, only some centres were able to provide annual or bi-annual follow-up assessments with annual postal contact, while others were unable to do so because of insufficient administrative support.

Some centres store sperm for men undergoing all gonadotoxic therapies including those for non-malignant disorders, while others provide services solely for cancer survivors. These variations in practice in different regional centres of the UK may represent differing interests of local clinicians, service provision and practices. Funding for non-malignant cases is in even greater disarray and demand is severely under-assessed and underfunded and consequently most services are unable to include them.

There is widespread concern regarding the type- and dose-dependent effects of chemotherapy on the gametes (Arnon et al., 2001) and the risk of transmissible genetic damage to the future...
offspring (Generoso et al., 1971; Becker and Schöneich, 1982; Pydyn and Ataya, 1991). A marked reduction in the quality of sperm parameters after even just one course of chemotherapy has been reported (Oppenheim et al., 2005) in addition to the potential increase in the risk of miscarriage (Arnon et al., 2001) abnormalities and poor neonatal outcome (Holmes and Holmes, 1978; Meirow and Schenkar, 1996).

Radiotherapy has similarly profound effects and in the rhesus monkey type B spermatocytes disappear from the testis within 17 days of 1 Gy radiotherapy, and spermatids within 31 days (de Rooij et al., 1986). Although no increase in the risk of genetic defects or congenital malformations has been noted in children born naturally to parents who have had previous chemo or radiotherapy, the use of assisted conception technologies may increase this risk in men who have had partial gonadal toxicity and suffer from OATS. The intra-cytoplasmic injection procedure with IVF may help achieve conceptions that would not have occurred naturally. Similar caution has been proposed in females undergoing assisted conception between or shortly after chemotherapy (Holmes and Holmes, 1978; Meirow and Schenkar, 1996).

The accreditation standards for all andrology laboratories (diagnostic services and fertility clinics both) are produced by CPA UK Ltd and the HFEA. These overarching principles form the basis on which ‘Laboratory Andrology: Guidelines for Good Practice’ have been derived.
have chosen to discard, use or move to another centre. On the current referring pattern, it has been estimated that over the next 10 years, this centre would expect to add ~800 more patients. As the average number of samples frozen is just under two per case, ~1600 more samples will be frozen in the same facility during the next 10 years. It has been further estimated that in this centre alone in 55 years, the number of cancer patients with stored samples will be 4400 and number of samples stored will be ~8800.

The effort involved in maintaining this storage and associated administration is evident and progressively rising. This figure can be replicated across the country many times over as there are at least four other equally large centres within this group of nine respondent centres alone. Hence developing a consensus on funded storage period, uniform and peer reviewed management policy for the stored samples is essential.

Cost implications for long-term storage need to be borne in mind given the current financial climate for health services overall. It is clear that active involvement and ownership of the oncologists and haematologists in management of the storage capacity needs to be encouraged. The majority of the centres wish to assess the risk of relapse in a discussion with the oncologist before allowing the patient to make an informed choice; however, there was variation in opinion as to when such a discussion should happen (5 or 10 years). It may not be possible to apply the same rule for all cases as some conditions. For example, testicular cancer has a high cure rate after 5 years (Cancer Research UK, 2011) whilst other conditions may still have a significant risk of relapse after 5 years.

All centres unanimously agreed that final decisions must respect the patient’s right to decide and hence be taken with patient’s considered informed written consent. Appropriate time, information and counselling should be available. The estimated stored patient/sample numbers in one of the five large regional centres alone highlight the urgent need to develop an active policy for managing this service.

This survey has enabled us to document the current heterogeneity in the provision, organization, maintenance and management of the cryopreservation services in the UK. However, the results have also identified areas of agreement and enabled the author to suggest a number of recommendations, presented in the Supplementary material submitted with this paper. These could be used as a starting point in the development of national guidelines.

Supplementary data

Supplementary data are available at http://humrep.oxfordjournals.org/.

Author’s roles

V.S. authored the questionnaire for the survey, and was involved in circulation of the questionnaire to all centres, collation of results from returned questionnaires, reviewing related literature work and drafting the manuscript.

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(Laboratory Andrology: Guidelines for Good Practice, 2011). All of them include organization and quality management system; personnel; premises; environment; equipment, information systems and reagents; pre- examination process; examination process; post examination phase; evaluation and quality assurance. While some laboratories have both HFEA and CPA accreditation, others are only licensed by the former. Most centres are already carrying the heavy burden of regulation by HFEA, ISO, HTA and CARE standards. Whether or not CPA accreditation confers additional quality assurance needs to be assessed.

One of the five equally large centres (Leeds) currently has sperm stored from ~1000 men. To date very few (4%) of these patients

Table VI Centre’s policies regarding discarding of stored sperm.

<table>
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<tbody>
<tr>
<td>Other indications</td>
<td>5/9 centres would discard when: sperms analysis is normal if the test thaw in the stored sample showed absence of viable sperm</td>
</tr>
<tr>
<td>Discarding after 5 year relapse free recovery</td>
<td>9/9: expressed a need to consider: long-term prognosis with the oncologist patient’s age current fertility marital history</td>
</tr>
<tr>
<td>Discarding after partial gonadal toxicity (OATS)</td>
<td>2/9: patients should keep their pre-chemo sperms if they wished Other centres: would allow sperm to perish with patient’s written and informed consent</td>
</tr>
</tbody>
</table>

Table VII Centre’s policies regarding advising patients regarding costs of storage.

<table>
<thead>
<tr>
<th>Advice to patients</th>
<th>1/9: advised that primary care trust (PCT) may: have time-limited funding patient may have to self-fund storage costs upon withdrawal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action in the event of funding being withdrawn</td>
<td>8/9: no specific advice given 9/9: centres felt obliged to maintain storage until HFEA consent expires 6/7: centres in England offer patients an option to self-fund storage</td>
</tr>
</tbody>
</table>
References


Laboratory Andrology. Guidelines for Good Practice 2011; www.andrology.pwp.blueyonder.co.uk/ABAguidelines1.0.pdf.


