Sperm banking in testicular cancer survivors: Low utilization, high costs, and patient-reported barriers from a Canadian cohort

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ABSTRACT

Introduction: Testicular cancer (TC) affects young men in their reproductive years. Although sperm cryopreservation is recommended before treatment, real-world utilization and patient experiences in Canada remain poorly described.
Methods: We conducted a retrospective chart review with a prospective telephone survey of men with TC who underwent sperm cryopreservation (2007–2019) at Manitoba's sole fertility preservation centre. Demographic, treatment, and semen parameters were abstracted from medical records. A structured questionnaire assessed counseling, decision-making, costs, banked sperm utilization, and fertility outcomes.
Results: Of 42 eligible men, 24 (57%) completed the survey. The mean age at banking was 25.6 years. Most (71%) received chemotherapy in addition to orchiectomy; 29% underwent orchiectomy alone. Only two men (8%) banked sperm before orchiectomy; the remainder did so prior to systemic therapy. Abnormal semen parameters were common (79%), with a median

KEY MESSAGES

- Sperm banking utilization was low in this Canadian cohort of testicular cancer survivors, at only 13% using their banked sperm for ART; however, natural and assisted fertility rates remain favorable.
- Financial and decisional challenges were key barriers to banked sperm utilization, with >50% of participants reporting costs and time constraints as burdensome.
- Early structured counseling, faster referrals, and public funding can ensure equitable access for fertility preservation and optimize testicular cancer survivorship care.

sperm concentration (13.0 million/mL, interquartile range [IQR] 3.0–21.5) and total sperm count (14.8 million, IQR 8.6–84.9) below WHO 2021 limits. Counseling occurred for 88% of men, though half felt rushed in their decision-making. The mean cost was approximately $2000 over three years, and 58% found this burdensome. Only three men (13%) used their cryopreserved sperm, all after chemotherapy, each resulting in a live birth through assisted reproductive technology (ART). Eleven men (46%) conceived naturally after treatment, eight (33%) had not yet attempted conception.

Conclusions: In this Canadian cohort, sperm banking utilization was low, and most survivors achieved natural conception. Financial burden and decisional stress were frequent. Enhanced counseling and public funding for fertility preservation may improve equitable access and survivorship care.

INTRODUCTION

Testicular cancer (TC) is the most common solid malignancy in young men, typically diagnosed in the second or third decade of life, when family planning and fertility are of major importance[1]. Fertility may already be compromised at diagnosis: up to 50% of men with TC present with abnormal semen parameters, and up to 24% with azoospermia, even before treatment initiation.[2–4]

Treatment further impacts fertility potential. The effect of orchiectomy is variable, with some studies demonstrating worsened semen parameters or azoospermia, while others suggest improvement in semen parameters among men managed with surveillance[5,6]. Chemotherapy, particularly with platinum-based or alkylating agents, carries dose-dependent risks: approximately 20% of men develop azoospermia at one year, although partial spermatogenesis recovers in nearly half by two years and in 80% by five years[7–9]. Retroperitoneal lymph node dissection (RPLND) can reduce fertility, but modern nerve-sparing techniques mitigate this risk; reported fertility rates are 62% after nerve-sparing versus 37% after non-nerve-sparing procedures[10]. Radiation is also gonadotoxic in a dose-dependent fashion, with the highest risk after direct testicular radiation, although shielding during retroperitoneal radiation reduces exposure[9,11].

Given these risks, fertility preservation through sperm cryopreservation (sperm banking) is considered standard of care[12]. Long-term fertility outcomes remain favourable, with live birth rates of 80% using intrauterine insemination (IUI) and 74% using in vitro fertilization (IVF) after up to 15 years of sperm storage[13]. Sperm cryopreservation is recommended for all men with TC, ideally prior to orchiectomy, chemotherapy, radiation, or RPLND[14,15]. Despite these benefits, utilization of cryopreserved sperm among TC survivors remains low, estimated at 9–11% internationally[12,16].

In Canada, little is known about the real-world utilization and patient experience with sperm banking. We aimed to evaluate fertility outcomes, utilization rates, and patient-reported barriers, including financial and decisional challenges, among men treated for TC in Manitoba.

METHODS

Ethics approval was obtained from the University of Manitoba Health and Research Ethics Board (HS26145).

Study design and setting

We conducted a retrospective chart review with a prospective telephone survey at the sole fertility preservation centre in Manitoba, Canada.

Population

Men diagnosed with testicular cancer who underwent sperm cryopreservation between 2007 and 2019 were eligible. Patients were identified through clinic records.

Data collection

Patient demographics, semen parameters, and treatment data were abstracted from medical records. A structured telephone questionnaire developed by the study team based on clinical experience was administered to assess patient experiences with fertility preservation and subsequent reproductive outcomes (Appendix 1). The survey explored whether infertility risks were discussed prior to treatment, the type(s) of therapy received, and the timing of when sperm cryopreservation was offered during the diagnostic or treatment process. Participants were asked about their motivations for banking sperm, whether the process was straightforward or challenging, and their perceptions of overall cost and affordability. To capture the decision-making experience, patients were also asked whether they felt they had sufficient time to make an informed choice before initiating treatment. Fertility outcomes were assessed by inquiring whether cryopreserved sperm had been used for assisted reproductive technologies (ART), the success of any ART attempts, and whether participants had biological children, and, if so, whether they were conceived naturally or through ART.

Analysis

Descriptive statistics were performed. Continuous variables were reported as means (range), and categorical variables as counts and percentages.

RESULTS

Patient characteristics

Of 42 men who underwent sperm cryopreservation prior to treatment for testicular cancer between 2007 and 2019, 24 (57%) completed the questionnaire. All participants answered all questions. Among the remaining 18, four declined participation and 14 could not be contacted.

The mean age at sperm banking was 25.6 years (range 17–35). The mean age at telephone survey was 34.9 years (range 25–49). The median time from referral to consultation was 4 days (range 0–14). The median interval from sperm banking to the follow-up survey was 8.83 years (range 4.7–17.1). Most patients underwent chemotherapy in addition to orchiectomy (71%, n=17), while 29% (n=7) had orchiectomy alone (Table 1). The quotations presented below are illustrative of each theme.

Semen analysis

Among the 24 men successfully contacted, 22 banked sperm following orchiectomy and prior to systemic therapy, while two did so before undergoing orchiectomy, reflecting the timing of fertility referral and counselling. Overall, 19 of 24 men (79%) demonstrated at least one abnormal semen parameter post-orchiectomy. The median semen volume was 3.0 mL (IQR 1.9–4.1), median sperm concentration was 13.0 million/mL (IQR 3.0–21.5), median total motility was 50% (IQR 42.5–66.3), and median total sperm count was 14.8 million (IQR 8.6–84.9). Median sperm concentration and total sperm count were below WHO 2021 lower reference limits, consistent with the known impact of testicular cancer on semen quality.

Counseling and timing of cryopreservation

Most respondents (88%, n=21) reported that infertility risks were discussed prior to treatment. Three patients did not recall being informed about infertility risks by their physician and instead learned about sperm banking through their own research. Cryopreservation was most commonly offered (75%, n=18) prior to starting chemotherapy. Many described counselling as rushed or limited in detail, with one patient noting he was “only given a week between diagnosis and surgery,” leaving little opportunity to consider cryopreservation options. Half of respondents (50%) felt the decision to bank sperm had to be made under time pressure and were reluctant to delay treatment.

Motivations for sperm banking

Future family planning was the primary motivator. One participant explained: “I wasn’t thinking of having kids at the time, but better to be on the safe side.” Others described parental encouragement as decisive: “At the time I was too overwhelmed. My parents told me to ‘just do it and we’ll pay for it,’ and I’m grateful now.” Several participants viewed sperm banking as reassurance during a stressful time: “I wanted the insurance, even if I never needed it.”

Additional motivations included fear of permanent infertility, a desire for peace of mind, and the unpredictability of treatment outcomes. A few participants described sperm banking as a way to regain control amidst the uncertainty of cancer. One participant explained, “Everything was moving so fast, but freezing sperm felt like the one decision I could make to protect my future.” Others highlighted that they would not have considered cryopreservation without direct recommendation from their oncologist, underscoring the importance of physician-led counselling.

Process and perceived burden

The majority (92%) reported that the process was straightforward. However, logistical challenges were common, including clinic hours, travel, and the lack of reminders for annual payments. Although the technical aspects of sperm collection were not described as difficult, participants noted that the context of a recent cancer diagnosis made the process emotionally challenging. Several participants mentioned that producing a sample under time pressure was uncomfortable or stressful. Others emphasized the administrative aspects, such as keeping up with annual payments, were more burdensome than the initial procedure itself. For younger patients and those without stable employment, even small recurring costs created ongoing anxiety. As one participant summarized, "Freezing was simple enough, but every year the bill was a reminder of cancer and something I wasn't sure I'd ever use."

Costs of sperm cryopreservation

The average reported cost of sperm banking was approximately $2000 over three years, comprising an upfront registration fee ($300), per-deposit charges ($250), and annual storage fees ranging from $200 to $500. While some participants considered this manageable, particularly if costs were covered by insurance or family, most (58%) described the expense as burdensome.

For many, the ongoing nature of storage fees was the most difficult aspect. One man explained: "It was $380 a year just to keep them frozen. At the time I thought it was high, and eventually I threw them out." Another reported discontinuing storage entirely due to mounting charges: "I stopped paying after a few years. It wasn't that the process was bad—it was just the annual fees that became too much."

Others faced financial stress at the time of use, with one participant noting: "I've already paid $500–600, but I currently owe $2500. You have to pay the balance before you can use or destroy the samples, which is stressful when you're already dealing with cancer." In contrast, a patient whose costs were covered by his employer reflected: "For me it was free, so I didn't worry. But if I had to pay out of pocket, I'm not sure I would have kept it."

The financial strain extended beyond storage to downstream fertility treatments. One man who ultimately conceived through IVF described: "Between the banking and the IVF cycles, I've spent over $40,000. It worked in the end, but it shouldn't cost this much to have a family after cancer." Together, these accounts highlight that while cryopreservation provides peace of mind, ongoing expenses represent a major barrier and contribute to inequities in access within Canada's publicly funded healthcare system.

Fertility outcomes and utilization of banked sperm

Only three men (13%) reported using cryopreserved sperm for ART. Two achieved successful live births via IVF and one via IUI. All three men had undergone chemotherapy.

Despite low utilization of banked sperm, natural fertility outcomes were generally favourable. Eleven men (46%) achieved natural conception after treatment, with some fathering multiple

children. Ten men reported conceiving after chemotherapy or radiation, highlighting the persistence of fertility in many survivors. Eight men (33%) reported that they had not yet attempted to have children or were not currently planning to, though several expressed interest in pursuing fatherhood in the future. Two men were unsuccessful with natural conception and have not yet pursued ART.

DISCUSSION

Treatments for testicular cancer carry well-recognized risks to male fertility. Recent clinical guidelines recommend fertility discussions for all men with testicular cancer, including adolescents[17]. Orchiectomy may preserve or improve semen parameters in some men, but others experience decline, and chemotherapy, radiation, or non–nerve-sparing RPLND adds further risk of long-term impairment[3,8,9]. In this provincial Canadian cohort, only 13% of men used their banked sperm after treatment for testicular cancer, consistent with international utilization rates of 9–11%[12,16]. Nearly half (46%) achieved natural conception following treatment, including men who received chemotherapy or radiation. This is a noteworthy finding that provides key reassurance for patients and clinicians that many survivors retain fertility despite gonadotoxic therapy. These findings reflect the dual reality of fertility in testicular cancer: the risk is sufficiently high to warrant universal counselling and cryopreservation, yet the actual need for banked sperm is difficult to predict. Importantly, all three men in our cohort who used cryopreserved sperm achieved successful live births through ART, demonstrating the effectiveness of sperm banking when needed.

Baseline semen quality before systemic therapy was often impaired, with 79% of men demonstrating at least one abnormal parameter at the time of banking. Median sperm concentration (13.0 million/mL) and total sperm count (14.8 million) were below WHO 2021 reference limits, consistent with prior studies showing that baseline semen abnormalities are common even before treatment and may worsen after orchiectomy [2–6]. While no patients in our cohort were azoospermic, the rate of azoospermia has been reported to be as high as 24% in testicular cancer patients[15].

Our study highlights two important patient-reported barriers. First, the financial burden was substantial. Participants reported an average cost of approximately $2000 over three years, and 58% considered these expenses burdensome. The recurring nature of storage fees was particularly challenging, leading several men to discontinue cryopreservation due to cost. Some described accumulating debt or relying on insurance and family support, while others worried about the added expense of downstream ART. One participant reported spending over $40,000 to achieve a live birth. These findings expose inequities in Canada's publicly funded healthcare system, where oncologic treatment is covered but fertility preservation and treatments are not. As socioeconomic information and insurance coverage of the participants were not captured, affordability cannot be extrapolated across groups. However, with more than half of participants reporting costs as burdensome, out-of-pocket expenses evidently remain a significant barrier.

Second, decisional stress was common. Half of respondents reported feeling rushed in their decision to bank sperm, often because of the compressed timeframe between cancer diagnosis and orchiectomy, coupled with the psychological concern that delaying surgery could worsen cancer outcomes. While many providers aim to perform orchiectomy within two weeks of diagnosis and many centers in Canada performing orchiectomies through emergency operating room slates, evidence suggests that short delays to allow sperm banking are unlikely to compromise oncologic outcomes[18]. In our cohort, the time from referral to sperm banking was 5.4 days, which is consistent with Canadian data reporting average referral time of two days, with a maximum of four days [19]. However, referral times in smaller centers may still pose challenges, and in situations where it may substantially delay cancer treatment, patients may forgo sperm banking altogether. Expediting oncology and fertility referrals is therefore critical.

Beyond biological and logistical considerations, participants emphasized the psychosocial value of sperm banking. Even among men who never used their samples, cryopreservation was described as an insurance policy that restored a sense of control and reduced anxiety during an overwhelming cancer experience. This aligns with the broader oncofertility literature, which recognizes fertility preservation as both a biological safeguard and a psychosocial intervention promoting autonomy and reducing decisional regret. The 2013 Canadian oncofertility framework identified similar challenges: fragmented referral pathways, inconsistent education, and poor interdisciplinary coordination limited timely access to fertility preservation [20]. Embedding automatic referral triggers at diagnosis, ensuring accessible clinic hours and off-site collection options, and integrating psychosocial and financial supports may mitigate the cost and decisional pressures reported in our cohort.

Limitations

Our study is limited by its small sample size (24 of 42 patients; 57% response rate), single-centre design, and reliance on patient recall, which may introduce selection and recall bias. Non-responders may have differed systematically from participants. The self-developed questionnaire limits the precision of reported outcomes. Nevertheless, this is the first Canadian study to combine semen parameter analysis, long-term fertility outcomes, and patient-reported experiences of cost and decision-making among testicular cancer survivors. Utilization of cryopreserved sperm is potentially underestimated due to the possibility of men who may choose to use their banked sperm in the future. Also, pre-orchiectomy semen parameters were not systemically captured. Another limitation of our study is that it did not assess participant's awareness of the potential for a tax refund, typically around 40–70% of their total expenditure on fertility treatments when filing their federal and provisional taxes. (https://www.canada.ca/en/public-health/services/sexual-health/financial-support-fertility-treatment-surrogacy.html)

Future directions

Future multicentre Canadian studies should evaluate sperm banking utilization and cost-effectiveness on a larger scale and examine the experiences of men who declined cryopreservation. Policy advocacy for government-subsidized fertility preservation is warranted to reduce financial barriers and ensure equitable access. Integrating structured fertility discussions earlier in the cancer care pathway, ideally at the time of the first consultation, may mitigate decisional pressure and improve the quality of survivorship care.

CONCLUSIONS

In this Canadian cohort of testicular cancer survivors, sperm banking utilization was low, with most men achieving natural conception despite impaired semen parameters at diagnosis and exposure to gonadotoxic treatment. However, significant financial burden and decisional stress were consistently reported. These findings highlight the importance of early, structured fertility counselling and support for public funding of fertility preservation to ensure equitable access and optimize survivorship care.

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FIGURES AND TABLES

Table 1. Demographics of testicular cancer patients who underwent sperm cryopreservation in Manitoba, Canada, and treatments received	
N=24	**Mean/range**
Age at referral (years)	25.6 (17–35)
Time from referral to sperm banking (days)	5.4 (0–18)
Treatments received	
Orchiectomy alone	7
Orchiectomy and chemotherapy	15
Orchiectomy, chemotherapy, and RPLND	1
Orchiectomy and radiation	1
Referral before orchiectomy	6
Referral before systemic therapy	18

RPLND: retroperitoneal lymph node dissection.

Table 2. ART utilization and natural conception outcomes of testicular cancer patients who underwent sperm cryopreservation in Manitoba, Canada	
Outcome category	**n (%)**
Used cryopreserved sperm for ART	3 (13%)
Intrauterine insemination	1
In vitro fertilization	2
Successful natural conception after treatment	11 (46%)
No attempts at conception	8 (33%)

ART: assisted reproductive technology.

Table 3. Patient-reported concerns related to sperm banking		
Category of concern	**Examples**	**n (%)**
Financial burden	Annual storage fees, upfront registration fee, per-deposit charges, ART costs	14 (58%)
Decisional stress	Feeling rushed in their decision, worrying about delaying surgery or chemotherapy	12 (50%)

Inadequate counseling	Feeling uninformed with infertility risks associated with sperm banking	3 (12.5%)

ART: assisted reproductive technology.