Sperm Banking: Fertility Preservation for Male Patients With Cancer

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Sperm banking (SB) involves collecting and freezing sperm for potential future use. It is a simple, noninvasive way for male patients with cancer to preserve their ability to have biologic children. This article provides the information needed by nurses to effectively discuss SB with their patients.

At a Glance
• Certain chemotherapy drugs, as well as testicular exposure to radiation, can impair sperm production.
• Before undergoing treatment that creates a risk of infertility, postpubertal male patients should be informed of their risk and offered the option of SB.
• The oncology team should initiate this discussion and provide patients with referrals to pursuing SB, if interested.

Background
SB involves collecting and freezing sperm for potential future use. Male patients obtain a semen specimen by masturbating. After analysis to ensure the presence of viable sperm, the specimen is placed in vials, frozen, and stored. Even after several decades, thawed sperm can produce a live birth (Katz, Kolon, Feldman, & Mulhall, 2013).

Candidates
All postpubertal male patients receiving cancer treatment and at risk for infertility should be offered SB. SB is not an option for prepubertal boys because they do not yet produce mature sperm.

Treatment with certain chemotherapy drugs, as well as testicular exposure to radiation, can impair sperm production. The effect of chemotherapy depends on the agents used (alkylating agents, platinum analogs, and anthracyclines are the most toxic) and the cumulative dose (Ginsberg, 2012; Howell & Shalet, 2005; Magelssen, Brydøy, & Fosså, 2006; Meistrich, 2009; Wallace, 2011). The effect of radiation depends on the volume of testicular tissue that is exposed and the cumulative dose. At the greatest risk are patients receiving radiation directly to the testes or experiencing significant radiation scatter from treatment directed toward the pelvic and inguinal regions; those receiving fractionated doses of more than 1.2 Gy are particularly at risk (Pasqualotto & Agarwal, 2013; Wallace, 2011). Although many men recover sperm production after treatment, some have reduced sperm count (oligospermia) and some have no sperm in their semen (azoospermia). For men with recovered sperm production, recovery usually occurs within one to three years but can take longer, depending on the toxicity of the therapy (Meistrich, 2009).

Pelvic surgery and radiation can cause injury to ducts, blood vessels, and nerves, potentially resulting in erectile or ejaculatory dysfunction (Magelssen et al., 2006). These patients may produce sperm, but they cannot transfer it to their female partner through intercourse. Patients at risk include those who have undergone retroperitoneal lymph node dissection without the use of nerve-sparing techniques, as well as those who have experienced surgery for or radiation treatment to any pelvic tumor close to reproductive structures.
Some patients whose treatment is unlikely to affect fertility may also want to consider SB. They may need prolonged systemic treatment (e.g., targeted therapy), future gonadotoxic treatment (e.g., transplantation), or additional future therapy (e.g., lymphoma carries a high risk of developing refractory disease or relapsing).

**Specimen Collection**

SB must be completed before treatment begins. Even a single treatment with gonadotoxic therapy can affect gamete quality and DNA integrity (Lee et al., 2006; Meistrich, 2009; Nangia, Krieg, & Kim, 2013). In general, patients are advised to collect three specimens to provide adequate volume for at least 10 vials (Stahl, Stember, Hsiao, & Schlegel, 2010; Trost & Brannigan, 2012). Between two and five days of sexual abstinence before each collection provides an optimal specimen. However, shorter intervals are acceptable if the available time is inadequate (Nangia et al., 2013). Collecting a single specimen also is worthwhile. With advances in reproductive technology, eggs can be fertilized with low numbers of sperm (Lee et al., 2006). SB is performed at a sperm bank or in the andrology laboratory of a fertility center. These facilities should be registered with the U.S. Food and Drug Administration. In some states, they are licensed according to their compliance with specific safety regulations.

If no local sperm banks are available, or if the patient is unable to provide a specimen at the sperm bank, consider the feasibility of a mail-in kit. Newly diagnosed patients admitted for inpatient urgent treatment should be offered SB if the semen collected can be transported within one hour to a sperm bank.

SB costs vary but, in general, are about $1,000, which includes the analysis, processing, and freezing of three specimens, as well as storage for the first year. Subsequent storage fees are about $400 annually. SB is rarely covered by health insurance, but some financial resources are available (e.g., Livestrong Fertility).

**Collection Alternatives**

Some males are unable to collect a specimen by masturbating because of illness, pain, anxiety, embarrassment, or religious or cultural beliefs. Although penile vibratory stimulation may be effective in some cases, electroejaculation is another option that involves the emission of a mild electrical current from a rectal probe to stimulate ejaculation (Katz et al., 2013; Wang, Muller, & Lin, 2013).

Because of disease, some men have impaired sperm production even before beginning treatment. This impairment is most common in men with testicular cancer, lymphoma, or leukemia (Agarwal & Allamaneni, 2005). Testicular sperm extraction involves the removal of a small amount of testicular tissue by biopsy or aspiration; any sperm found in the tissue are extracted and frozen (Katz et al., 2013; Wang et al., 2013). Reproductive urologists perform these procedures while patients are under anesthesia.

**Storage and Use**

Men should not discard their specimens until they have resumed normal sperm production and have been assured by their oncologists that they need no further cancer treatment. They may want to continue to store their specimens until they have completed their families or decide with certainty not to have children (Nangia et al., 2013).

Men who need to use their frozen sperm in the future will see a reproductive endocrinologist, a gynecologist who specializes in the diagnosis and treatment of infertility. He or she will determine the optimal technique for using the thawed sperm based on the number of stored vials and the sperm count and motility (Wang et al., 2013). In the instance of multiple vials and a high sperm count and motility, intrauterine insemination, which involves the instillation of thawed semen into the uterus, may be an option. However, three to six attempts may be needed, so in vitro fertilization (IVF) may provide a greater chance of success (Nangia et al., 2013). With IVF, the patient’s female partner receives hormonal medication for about 10 days to stimulate the ovaries, then mature eggs are retrieved. These eggs are fertilized with thawed sperm in the laboratory, and the resulting embryos are transferred into the uterus. If sperm count and motility are low, intracytoplasmic sperm injection may be used to increase the likelihood of successful fertilization; this procedure involves the manual injection of a single sperm into each of the retrieved eggs (Nangia et al., 2013).

**Implications for Practice**

Patients who do not ask about the impact of treatment on their fertility may be overwhelmed by their diagnosis or may not realize that their planned treatment has fertility risks. Consequently, the oncology team must initiate the discussion.

Oncology team members must collaborate to determine how best to introduce the topic. They must also keep in mind that the discussion should occur early enough before treatment begins so the patient can follow up on the information provided. Figure 1 offers information about locating sperm banks and obtaining mail-in kits, as well as finding a reproductive urologist and obtaining discounted rates for SB. Figure 2 provides resources to help healthcare providers educate patients about SB.

When discussing the risk of infertility, providers should be direct, honest, and straightforward in the same way they would discuss other side effects of treatment. They should explain that the precise risk for any one individual is impossible to predict, and that collecting and freezing sperm before treatment begins will increase the patient’s likelihood of having a biologic child in the future. Providers should be matter of fact when explaining the process of SB and describe it as they would any other type of specimen.
collection. To feel confident and avoid embarrassment, providers also should rehearse different ways to explain and discuss SB before talking with patients.

A number of considerations exist when speaking with adolescent male patients. At the time of diagnosis, they may not be thinking of future fatherhood and may find a discussion about SB embarrassing. They may initially seem indifferent or even say “no” to the option of SB. The healthcare provider’s ending of the discussion may demonstrate respect for the patient’s decision, but providers should balance this inclination with consideration of the patient’s future interests (Shnorhavorian, Johnson, Shear, & Wilfond, 2011).

Providers should introduce SB as a standard part of care for all newly diagnosed adolescent male patients (Achille et al., 2006). They also should create an opportunity to discuss this topic when the patient’s parents are not present. SB should be emphasized as an option that provides patients with more choices if they decide in the future they want to father children; it does not commit them to using their sperm. If patients remain hesitant, providers should continue the discussion and explore their reservations concerning SB, attempting to obtain their assent.

**Conclusion**

SB is a well-established technique that helps to preserve fertility in male patients undergoing cancer treatment. By relaying accurate information and knowing how to discuss this issue, oncology nurses can optimize their patients’ chances of having a family after cancer treatment.

**References**


Shnorhavorian, M., Johnson, R., Shear, S.B., & Wilfond, B.S. (2011). Responding to adolescents with cancer who refuse sperm banking: When “no” should not be the last word. *Journal of Adolescent and Young Adult Oncology, 1*, 114–117. doi:10.1089/jayao.2011.0028


