Published in final edited form as:

Am J Bioeth. 2012 ; 12(6): 38–43. doi:10.1080/15265161.2012.673688.

Preserving the right to future children: An ethical case analysis

Gwendolyn P. Quinn, Ph.D.^{a,b,*}, Daniel K. Stearsman, Pharm.D.^c, Lisa Campo-Engelstein, Ph.D.^d, and Devin Murphy, MSW^e

^aDepartment of Oncologic Sciences, College of Medicine, University of South Florida, Tampa, FL, USA

^bHealth Outcomes and Behavior, Moffitt Cancer Center, Tampa, FL, USA

^cDepartment of Bioethics, Medical Humanities and Palliative Care, College of Medicine, University of South Florida, Tampa, FL USA

^dOncofertility Consortium, Feinberg School of Medicine, Northwestern University, Chicago, IL, USA

^eJonathan Jaques Children's Cancer Center/Miller Children's Hospital/HARBOR-UCLA, Long Beach, CA, USA

Abstract

We report on the case of a 2-year-old female, the youngest person ever to undergo ovarian tissue cryopreservation (OTC). This patient was diagnosed with a rare form of sickle cell disease, which required a bone marrow transplant, and late effects included high risk of future infertility or complete sterility. Ethical concerns are raised, as the patient's mother made the decision for OTC on the patient's behalf with the intention that this would secure the option of biological childbearing in the future. Based on Beauchamp and Childress' Principlism approach of respect for autonomy, nonmaleficence, beneficence, and justice, pursuing OTC was ethically justified.

Keywords

fertility preservation; pediatric; ethics; decision-making

Introduction

Recent estimates suggest there are more than 270,000 survivors of childhood cancer, and long-term survivorship was found to be 80% in 2008 (Ries et al. 2008). As survivorship improves, there is increasing interest in quality of life, specifically the ability to have biological children (Nathan et al. 2008). To retain fertility for adulthood, pediatric patients need to be given the opportunity to preserve fertility prior to the initiation of treatment. Today, pediatric populations have a variety of fertility preservation options that are available depending on their age (Cohen 2009; Levine et al. 2010; Jadoul et al. 2010; Zoloth et al. 2008; Cohen 2008). This analysis explains the process of ovarian tissue cryopreservation (OTC) in a two-year old girl, and provides an ethical analysis of the mother's decision using principlism. Pseudonyms have been used to protect the identity of the child and her mother.

*To whom correspondence regarding this manuscript should be sent: Gwendolyn P. Quinn, Ph.D., 12902 Magnolia Drive, MRC-CANCONT, Tampa, FL 33612. Phone: 813-745-1359, Fax: 813-745-6525, gwen.quinn@moffitt.org.

Disclosure Statement

The authors do not have a commercial interest, financial interest, and/or other relationship with manufacturers of pharmaceuticals, laboratory supplies, and/or medical devices or with commercial providers of medically related services.

Case and Procedures for Maintaining Fertility

In July 2010, two year old Daisy Jones became the youngest person ever to undergo OTC (Goldstein 2010). Daisy has a rare form of sickle cell disease requiring a bone marrow transplant which damages the reproductive system including gonadal tissue. This is likely to result in permanent sterility (Jadoul et al. 2010; Lee et al. 2006). Females with conditions for which gonadotoxic therapies are used (primarily cancers but also other blood and neurological diseases) have options to preserve fertility for the future. OTC is an experimental procedure in which ovarian cortical tissue (thin sections of the ovary containing immature follicles) is removed and frozen according to established protocols (Oktay 2001; The Ethics Committee of the American Society for Reproductive Medicine, 2005). OTC is typically performed through a laparoscopy, a minimally invasive technique that utilizes small incisions in the abdomen (also called a ‘keyhole surgery’). For OTC, surgeons utilize 4 puncture sites and insert a tube in the cervix. The ovarian artery and ovarian vein are clamped open using clips, allowing the suspensory ligament to be cut and the ovary freed. The ovary and fallopian tube are removed and immediately transferred to a second team to be cut into cortical strips for freezing (Mayerhofer et al. 2010). The initial trials of OTC had a low success rate, both in the actual freezing of ovaries and successful pregnancies. This was due to the formation of ice crystals on the oocytes during the slow-freezing process, as well as the long interval between transplanting ovarian tissue and regaining a full blood supply for proper functioning (Ambrosinia et al. 2006). A newer technique, called vitrification, wherein ovaries or cortical strips are ‘flash-frozen,’ ensures that the water inside the cell does not crystallize (Isachenko et al. 2009). Lastly, a recent technique gaining credibility in order to re-establish blood flow more quickly is cortical grafting upon transplantation. Cortical grafting involves transplanting each piece of cortical tissue and directly linking the blood vessels that provide blood to the ovarian tissue (Silber, 2009).

Currently there are known to be at least 900 babies born from the slow freezing process, and no higher risk of birth defects (Noyes et al. 2009). There are other experimental methods for girls such as egg freezing, and established methods such as pelvic shielding and ovarian transposition, wherein ovaries are moved outside the area of treatment. However, experimental OTC is the only option available for girls who are pre-pubertal (Poirot and Schubert, 2011).

Ethical Analysis

Various ethical questions can be posed concerning the process of OTC. Questions regarding the interests, motives and potentials interest of the parties involved are worth considering. Each of these interests could be examined in light of various principles set forth since W.D. Ross set forth his Six Prima Facie Duties; noted principles set forth in the Belmont Report and those set forth by Robert Veatch, Baruch Brody, and Bernard Gert could be instrumental in the analysis of OTC (Veatch 2007.). However, this analysis seeks to examine OTC in light of questions that arise from Beauchamp and Childress’s Four Principles Approach ultimately answering, ‘Was it ethically justifiable for Daisy’s mother, Ms. Jones, to cryopreserve her daughter’s ovarian tissue?’ This popular approach of Principlism advances four moral principles of respect for autonomy, nonmaleficence, beneficence, and justice (Beauchamp and Childress 1979; Beauchamp and Childress 2009).

Respect for Autonomy

Respect for Autonomy esteems individuals’ ability to make their own choices. It has been described as requiring more than “noninterference in others’ personal affairs”, but “building

up or maintaining others' capacities for autonomous choice while helping allay fears and other conditions that destroy or disrupt autonomous action" (Beauchamp and Childress 2009, p. 103). A child's right for fertility preservation has been cited in bioethics literature as a "'right in trust', to be safeguarded until the child reaches adulthood" (Jadoul et al. 2010). Jadoul et al. (2010) argues that this right, if medically acceptable and with available resources, must be evaluated with an ethical obligation to act in the child's best interest, as determined through the specific medical facts of each child's case. Citing Feinberg (1992) and Davis (1997), Jadoul et al. posits that children have the right to an open future and parents are justified in using resources to maintain this open future.

It is not known if this procedure will be efficacious for Daisy. It is likely to be at least another 16 years, when she reaches legal adulthood at age 18 until she considers the use of her preserved ovarian tissue, although there have been cases of teens seeking infertility treatment (Beauchamp and Childress 1979). Daisy may not even need her preserved tissue because her fertility may not have been lost, or the production of human gametes from pluripotent human stem cells may be perfected (Oktay 2009). However, it was not known if this procedure would be efficacious at the time Ms. Jones needed to make a decision. The question remains as to whether Ms. Jones was ethically justified in obtaining OTC for her daughter and thereby preserving her future right to procreative freedom. Additionally, if Ms. Jones had decided to forgo this fertility preservation option, should she be regarded as one who violated Daisy's "right in trust"?

Since Daisy is of an age where her wishes cannot be known and autonomous decision making is not possible, her mother served as her proxy decision-maker and appears to have made a decision she believed to be in her best interest. One potential concern with Ms. Jones's decision to pursue OTC is that her own desires interfered with her ability to make a decision for Daisy's best interests. Specifically, Ms. Jones' actions to preserve Daisy's fertility may serve as a strong indicator of her expectations for grandchildren, and for Daisy's future to include motherhood. This may make Daisy feel obligated to step into a traditional social role of biological motherhood due to her mother's efforts and expenses. In other words, there is a concern that Daisy's autonomy may be diminished due to the guilt she will feel if she does not use her frozen ovarian tissue. Even if Ms. Jones does not overtly pressure Daisy to become a biological mother, the mere knowledge that her mother and physicians chose for her to undergo OTC may make her feel like she is betraying them and their decision for her if she does not use the frozen tissue.

Here we enumerate five reasons why the concern that Daisy will feel pressured into biological motherhood is not as troubling as it may seem on the surface. First, we do not even know if Ms. Jones desires grandchildren and if this desire is strong enough to significantly impact decisions she makes. Second, we do not know if Ms. Jones has other biological children besides Daisy. If she does, even if Daisy never has biological children, Ms. Jones can still be it biological grandmother thanks to her other children. Third, and is a problem common in proxy decision making, is the fact that it is often difficult to tease apart the proxy's and the individual's values. Sometimes the proxy may not even be aware that her values are influencing her decision making (Levi and Drotar 1999). Furthermore, especially in the case of a parent/child relationship, the child's values are strongly shaped by her parents' values and her parents' values often remain her values even in adulthood (Luster and Okagaki 1993). Fourth, the pressure Daisy may feel to abide by her mother's wishes is not unique to OTC. Parents often invest time and money and endure sacrifices with the explicit or subtle expectation that their children will follow a specific path (Sigel et al. 1992). For example, once children are born, parents can start contributing pre-tax money to an education fund that can only be used for the children's college education. By contributing to this fund, parents are assuming that their child will attend college. If children are aware of

such a fund, they may feel pressured to attend college even if it is not something they would like to do. Just like the knowledge of frozen ovarian tissue may cause Daisy to feel obligated to become a biological mother, so too could the knowledge of a college fund lead children to feel obligated to attend college. Fifth, though this is perhaps not a direct response to this objection, it is worth noting the undertones of gender stereotypes in this objection. It seems less likely that this concern would be raised if Daisy's proxy were her father; that is, it seems unlikely that people would be worried that Daisy's father chose OTC because of his desire to be a grandfather. There is a strong cultural belief that women are innately programmed to desire children (Upchurch et al. 2002) (and perhaps grandchildren as well). This belief, coupled with the gender stereotype that women are less intellectually equipped to make good and rational decisions, appears to be at play in this objection (Eagly, 2002).

Once Daisy is considered rational and competent to make her own decisions, according to the principle of respect for persons, she should be granted full reproductive autonomy, which includes decisions about OTC. Ms. Jones exhibits respect for autonomy by ensuring Daisy has access to her ovarian tissue and thus future parenthood, should she desire it. Her mother guaranteed that Daisy would have the opportunity to make an independent choice and maintain sovereignty over her reproductive rights; the alternative being her mother's decision to not pursue OTC and extinguishing Daisy's choice to become a biological parent in the future.

Nonmaleficence

Could OTC cause harm to Daisy? The principle of **Nonmaleficence** suggests that it is wrong to cause pain or suffering or to deprive others of the goods of life. It is described as the imposition of "an obligation not to inflict harm on others." (Beauchamp and Childress 2009, p.149). Biological parenthood itself is generally considered a good, if not a human right (United Nations 1948). Current medical evidence indicates Daisy will not suffer any increased harms or medical risk as a result of OTC. Indeed, the procedure to obtain the tissue carries risk as with all surgeries and use of anesthesia; however this only adds slightly to the risk that Daisy will already be exposed to for her sickle cell treatment which includes ablative conditioning. Future grafting of frozen ovarian tissue does carry a risk of re-seeding the disease if neoplastic cells are present, yet there are methods to test for neoplasm in this tissue and some emerging techniques, such as isolating follicles and the use of in vitro maturation of oocyte follicles, avoid the problem of re-seeding altogether (Oktay 2009). There may be inherent research-related risks such as loss of privacy or psychological harm. Daisy's loss of privacy has already occurred, as her story was published in the New York Post with both her name and photo. The risk of psychological harm relates to the experimental nature of the procedure. Ms. Jones must have signed an informed consent document that she understood OTC was experimental, had low rates of success, and was not a guarantee for a future pregnancy (Jadoul et al. 2010). While these risks were likely clear to Ms. Jones, they may not be as clear or acceptable to Daisy by the time she reaches adulthood.

A further consideration is that of Daisy's frozen tissue by use of another person or in the event of her death. For Daisy's best interests, the consent form would include recommendations for destroying the preserved tissue in the event that Daisy does not survive, as well as specifying the use of the tissue in the future is only for Daisy herself (ASRM, 2005). Daisy is not only at-risk of dying due to complications with her treatment and illness itself, but as an adult she is just as likely as the general population to experience serious injury or death. A proper consent form would prevent violating Daisy's autonomy via posthumous reproduction (Jadoul et al. 2010). Utilizing Daisy's stored tissue would violate her autonomy by creating a child without her consent. Thus, although she cannot be

directly harmed through creating children posthumously, there is potential for the future child to be psychologically harmed knowing that they were not consented to by their biological mother. The American Society for Reproductive Medicine (ASRM, 2005) offers guidelines on the types of information that should be in a consent form, such as the disposition of stored tissue after death and the use of the stored tissue by others. However, since consent forms are currently only a guideline and not a law or requirement, it cannot be assumed they are a measure of standard practice. Ultimately, by cryopreserving tissue for Daisy's future use, her mother has decreased the likelihood that she will suffer from the mental anguish of infertility (Quinn et al. 2010a) and/or be deprived of the opportunity of biological motherhood.

Another potential harm that should be taken into consideration is that medical researchers of OTC have a scientific and financial interest in performing this procedure. In order to move OTC from the classification of experimental to established, researchers have to continue studying it and the opportunity to do so on humans could greatly improve their work. OTC becoming an established procedure could financially benefit researchers in a variety of ways. Even if OTC never becomes established, it can still be financially lucrative since ART, in part because of its lack of regulation, is notorious for extremely high prices that rise to what the wealthy are willing to pay (Spar 2009). The concern here is that the scientific and financial interests of researchers could lead them to be less than honest in order to have the opportunity to perform OTC. For example, researchers may downplay the experimental nature of OTC leading to false hope in their patients. There is also the concern about a potential conflict of interest if the researcher is also the patient's physician as these roles have different priorities (Coller 2006). It is first worth pointing out that these concerns are common to all types of experimental research and not just to OTC. Many of these concerns can be mitigated by requiring all experimental procedures to follow IRB protocols.

Beneficence

Beneficence proffers one's duty to help others and promote good. Some studies conducted with adults who had cancer indicate their preserved fertility was a symbol of optimism and they attributed their successful wellness and survivorship to this "frozen hope" (Quinn et al. 2010a; Lee et al. 2010; Shin et al. 2005). Further, it has been suggested that preserved fertility in girls may contribute to a future mental sense of well-being, the ability for self-determination, and restoration of autonomy concerning reproduction (Cohen 2009).

Opponents of the use of fertility preservation in children argue that "no one dies from infertility" (Cohen 2008 p.30); meaning it is not necessary for individual survival. However, much of medicine is about improving quality of life for those with chronic or other conditions (e.g. poor vision, chronic migraines, broken bones, the common cold, etc.) and not focused solely on conditions that threaten one's life. As cancer survivorship has increased, quality of life issues have emerged as an important component of cancer care. Many insurance companies cover treatment for iatrogenic conditions, even when these conditions are "merely" quality of life issues. For instance, many insurance companies cover wigs for women undergoing chemotherapy, and the Women's Health and Cancer Rights Act—a federal healthcare mandate effective 1998—requires all insurance companies to cover the costs of breast reconstruction if they cover the costs of mastectomy. At least part of the reason why these iatrogenic conditions are covered is due to beneficence: enabling women to reconnect with their feminine identity by "replacing" gender markers (i.e. head hair and breasts) that cancer treatment destroyed (Campo-Engelstein 2010).

Another significant gender marker for women is pregnancy and motherhood. Historically and today, women's identities and social worth are closely tied to their reproductive

capabilities (Gardino et al. 2011). Women who are infertile (but otherwise healthy) are twice as likely to be depressed as fertile healthy women and many of them experience levels of psychological distress comparable to women with life-threatening illnesses (Gardino et al. 2011). Infertility is devastating for many women—something they see as spoiling their identities and signifying a failure in their roles of woman, wife, and mother (Greil 1991). Due to the high value placed on biological motherhood, infertile and childless women are often stigmatized and devalued (Nathan et al. 2008; Jennings 2010; Fleetwood et al. 2010). Ms. Jones' decision to preserve Daisy's fertility may be because she recognizes the psychological harms which may occur at both the individual and social level from infertility. She may believe OTC is a way of promoting "good" for Daisy.

Even if one understands the importance of motherhood to women in society, one could object to OTC, especially because biological reproduction is not the only way to become a mother. There is an alternative way – adoption – and one may argue that this alternative is preferable for any number of reasons (e.g. it is less medically invasive for Daisy, is less expensive, it helps an orphaned child find a home, etc.). While adoption is an alternative way to become a parent, it is often not easy or, in some states, possible for cancer survivors, or those with other chronic health conditions to adopt.

Indeed, survivors face unique barriers in the adoption process (Crockin 2005; Gardino et al. 2010). Thus what may appear as an alternative to OTC is usually not a real option for cancer survivors or those with certain serious chronic health conditions such as HIV/AIDS. This further reinforces Ms. Jones' ethical justification in preserving Daisy's tissue for future reproduction since her options may be limited not only by her own health, but also by adoption policies. Under the principle of beneficence Ms. Jones protected her daughter's future reproductive options and rights, thereby promoting the good of motherhood and having biological children.

Justice

The broad concept of **justice** refers to what is fair, what is deserved, or what one may or may not be entitled to (Beauchamp and Childress 2009, p. 241). Is there a moral duty to provide OTC for Daisy in the event Daisy's caregiver or caregivers cannot afford these services? What is fair and equitable? Tension exists between what is ideal, that all patients like Daisy be offered the opportunity for OTC, and the present reality, that some who may desire OTC may, for economic reasons, may be unable to afford this procedure.

While we believe discussing OTC and other fertility preservation technologies with all patients is important--disclosure of potential iatrogenic harms like infertility and potential responses to such harms is a necessary component of informed consent--we do not think failing to provide OTC would be an injustice to Daisy. The main reason is we do not think OTC is, or should be, the standard of care at this point given its experimental nature. Claiming that OTC should be standard of care may lead to the conclusion that parents and health care professionals who do not provide fertility preservation for children are morally neglectful as they did not prevent a harm they had a duty to prevent.

This narrower concept of **distributive justice** refers to the resources available and economic costs in ethical decisions. The costs of OTC have been deemed "exorbitant" by some opponents (Cohen 2008). Yet, claims about the exorbitant costs of some medical treatments sometimes fail to distinguish between the patient level and the societal level. On the patient level, OTC, like other forms of assisted reproductive technology (ART), is very expensive. One cycle of IVF, for instance, costs about 50% of a single person's annual income in the US. On the societal level, in contrast, OTC and other ART are not expensive: total ART

treatment costs as a percentage of total healthcare expenditure in the US is a meager 0.06% (Chambers et al. 2009).

Current estimates for the costs of OTC range from \$5,000 to \$30,000 depending on whether the fees are only for the procedure or include the additional costs for yearly storage, future grafting, or IVF (Levine et al. 2010; Fertile Hope, 2010). Although individual insurance companies may choose to cover these costs in relation to cancer treatment, there are currently no state laws requiring third-party reimbursement for fertility preservation (Cohen 2009; Quinn et al. 2010b; Campo-Engelstein 2010; Basco et al. 2011). National non-profit organizations provide some financial assistance to adults for fertility preservation, but not for pediatrics (Fertile Hope 2011). Also, some fertility clinics waive partial or all of the costs for cancer patients.

However, the high costs of storage and eventual transplantation could serve as a barrier for Daisy, and could potentially manifest psychological grieving processes over potential children she cannot afford to access. The justice, or lack of, therein lies within not only the high cost of this procedure, but the high costs of storage and transplantation that is typically only afforded to middle to high income families. If Daisy does not have the financial resources, lacks insurance coverage or is deemed ineligible at non-profit organizations, she is ultimately prevented from accessing and creating a genetically related child. These are relevant ethical issues of justice for many women, with or without health conditions.

It is not known if or how Daisy's mother paid for OTC. As previously discussed, if Ms. Jones did pay, the high price tag implies that she has strong expectations that her daughter will use this tissue in the future, regardless of Daisy's own desires for biological motherhood. Even if she did not pay for OTC, the fact she chose it for her daughter may still suggest her desire for biological grandchildren.

Conclusion

Fertility preservation in children and adolescents is controversial. As previously noted, even successful procurement and storage can be tempered with the possibility that financial barriers create inaccessibility and additional grievances. Beyond that, other ethical issues are inherent in the OTC procedure and fuel this controversy. These issues include ensuring that delaying medical treatment for OTC will not result in physical harm to the patient; establishing if transplantation may result in re-seeding of the original disease or cancer transplantation; assessing if oocytes are damaged resulting in miscarriage or developmental delays; issues of informed assent, and establishing protocols for the gametes in the event the patient dies (Dudzinski 2004). Additionally, OTC remains controversial as it is unknown whether this will place pressure on Daisy to become a biological parent. Are Ms. Jones' actions obligating Daisy to become a parent in the future? What will be the psychological consequences if Daisy does not wish to have biological children, knowing the financial, emotional, and physical effort her mother exerted?

Ultimately, we concur that based on Principlism, Ms. Jones was ethically justified in choosing OTC for her daughter. However, it would be desirable to know Ms. Jones' decision making process and what sources impacted her evaluation. In a recent review of ethical considerations in the use of experimental fertility preservation options for children, Patrizio and Caplan (2010) conclude that overall, "there should be no ethical objections to offer these services as they are offered with the scope of preserving future fertility" (724). Ms. Jones has set a precedent for parents who also must perform duties of proxy decision-making for their children in times of crisis. It will be advantageous for the research

community to follow-up with Daisy and elicit her perspective to improve ethical guidelines for the future.

Acknowledgments

Role of the funding source

Supported by the Oncofertility Consortium 5UL1DE019587-03 and 5R11HD058926-03 as part of the NIH Roadmap Interdisciplinary Research Consortia.

References

- ASRM. [Retrieved 12-13-11] The Ethics Committee of the American Society for Reproductive Medicine: Fertility preservation and reproduction in cancer patients. http://www.sart.org/uploadedFiles/ASRM_Content/News_and_Publications/Ethics_Committee_Reports_and_Statements/FertilityPreservation.pdf
- Ambrosini G, Andrisani A, Porcu E, et al. Oocytes cryopreservation: State of art. *Reproductive Toxicology*. 2006; 22:250–262. [PubMed: 16787736]
- Basco D, Campo-Engelstein L, Rodriguez S. Insuring Against Infertility: Expanding State Infertility Mandates to Include Fertility Preservation Technology for Cancer Patients. *J Law Med Ethics*. 2010; 38:832–839. [PubMed: 21105946]
- Beauchamp, TL.; Childress, JF. *Principles of Biomedical Ethics*. 1st ed.. New York: Oxford University Press; 1979.
- Beauchamp, TL.; Childress, JF. *Principles of Biomedical Ethics*. 6th ed.. New York: Oxford University Press; 2009.
- Campo-Engelstein L. Consistency in Insurance Coverage for Iatrogenic Conditions Resulting From Cancer Treatment Including Fertility Preservation. *J Clin Oncol*. 2010; 28:1284–1286. [PubMed: 20142588]
- Campo-Engelstein L. For the sake of consistency and fairness: why insurance companies should cover fertility preservation treatment for iatrogenic infertility. *Cancer Treat Res*. 2010; 156:381–388. [PubMed: 20811849]
- Cohen CB. Some perils of “Waiting to be Born”: Fertility preservation in girls facing certain treatments for cancer. *Am J Bioeth*. 2008; 8:30–35. [PubMed: 18726777]
- Chambers GM, et al. The economic impact of assisted reproductive technology: a review of selected developed countries. *Fertil Steril*. 2009; 91(6):2281–2294. [PubMed: 19481642]
- Cohen CB. Ethical issues regarding fertility preservation in adolescents and children. *Pediatr Blood Cancer*. 2009; 53:249–253. [PubMed: 19340857]
- Coller Barry S. The physician-scientist, the state, and the oath: thoughts for our times. *The Journal of Clinical Investigation*. 2006; 116:2567–2570. [PubMed: 17016549]
- Crockin SL. Legal issues related to parenthood after cancer. *J Natl Cancer Inst Monogr*. 2005; 34:111–113. [PubMed: 15784839]
- Davis DS. Genetic dilemmas and the child’s right to an open future. *Rutgers Law J*. 1997; 28:561–570.
- Dudzinski DM. Ethical issues in fertility preservation for adolescent cancer survivors: oocyte and ovarian tissue cryopreservation. *J Pediatr Adolesc Gynecol*. 2004; 17:97–102. [PubMed: 15050985]
- Eagly AH, Karau SJ. Role congruity theory of prejudice toward female leaders. *Psychological Review*. 2002; 109:573–598. [PubMed: 12088246]
- Feinberg, J. *The child’s right to an open future. Freedom and fulfillment: Philosophical essays*. Princeton: Princeton University Press; 1992.
- Fertile Hope. Financial Assistance. 2011 <http://www.fertilehope.org/financial-assistance/index.cfm>.
- Gardino S, Rodriguez S, Campo-Engelstein L. Infertility, cancer, and changing gender norms. *J Cancer Surviv*. 2011; 5:152–157. [PubMed: 21193963]
- Fleetwood A, Campo-Engelstein L. The impact of infertility: why ART should be a higher priority for women in the global South. *Cancer Treat Res*. 2010; 156:237–248. [PubMed: 20811838]

- Gardino S, Russell AE, Woodruff TK. Adoption after cancer: adoption agency attitudes and perspectives on the potential to parent post-cancer. *Cancer Treat Res.* 2010; 156:153–170. [PubMed: 20811831]
- Gardino S, Rodriguez S, Campo-Engelstein L. Infertility, cancer, and changing gender norms. *J Can Survivor.* 2011; 5:152–157.
- Goldstein J. Baby's babies 'saved': Op preserves 2-year-old's ovary. 2010 Available at: External link http://www.nypost.com/p/news/local/brooklyn/baby_babies_saved_whqwCfyF3Mb1xuWfauVa8N.
- Greil, A. Not yet pregnant: infertility couples in contemporary America. New Brunswick: Rutgers University Press; 1991.
- Isachenko V, Lapidus I, Isachenko E, et al. Human ovarian tissue vitrification versus conventional freezing: morphological, endocrinological, and molecular biological evaluation. *Reproduction.* 2009; 138:319–327. [PubMed: 19439559]
- Jadoul P, Dolmans MM, Donnez J. Fertility preservation in girls during childhood: it is feasible, efficient and safe and to whom should it be proposed. *Hum Reprod Update.* 2010; 93:1–14.
- Jennings PK. God had something else in mind: family, religion, and infertility. *J Contemp Ethnogr.* 2010; 39:15–37.
- Lee SJ, Schover LR, Partiridge AH, et al. American Society of Clinical Oncology recommendations on fertility preservation in cancer patients. *J Clin Oncol.* 2006; 24:2917–2931. [PubMed: 16651642]
- Lee MC, Gray J, Han SH, et al. Fertility and reproductive considerations in premenopausal patients with breast cancer. *Cancer Control.* 2010; 17:162–172. [PubMed: 20664513]
- Levi RB, Drotar D. Health-related quality of life in childhood cancer: Discrepancy in parent-child reports. *Int J Cancer Suppl.* 1999; 83:58–64. [PubMed: 10679872]
- Levine J, Canada A, Stern C. Fertility preservation in adolescents and young adults with cancer. *J Clin Oncol.* 2010; 22:1–11.
- Luster, T.; Okagaki, L. Multiple influences on parenting: Ecological and life-course - perspectives. In: Luster, T.; Okagaki, L., editors. *Parenting: An ecological perspective.* Hillsdale, NJ: Ebraum; 1993. p. 227-250.
- Mayerhofer K, Ott J, Nouri K, et al. Laparoscopic ovarian tissue harvesting for cryopreservation: an effective and safe procedure for fertility preservation. *Eur J Obstet Gynecol Reprod Biol.* 2010; 152:68–72. [PubMed: 20580151]
- Nathan PC, Greenberg ML, Ness KK, et al. Medical care in long-term survivors of childhood cancer: a report from the childhood cancer survivor study. *J Clin Oncol.* 2008; 27:4401–4409. [PubMed: 18802152]
- Noyes N, Porcu E, Borini A. Over 900 oocyte cryopreservation babies born with no apparent increase in congenital anomalies. *Repro BioMed Online.* 2009; 18:769–776.
- Oktaay K. Ovarian tissue cryopreservation and transplantation: Preliminary findings and implications for cancer patients. *Hum Reprod Update.* 2001; 7:526–534. [PubMed: 11727860]
- Patrizio P, Caplan AL. Ethical issues surrounding fertility preservation in cancer patients. *Clin Obstet Gynecol.* 2010; 53:717–726. [PubMed: 21048439]
- Poirot C, Schubert B. Fertility preservation in prepubertal children. *Bull Cancer.* 2011; 98:489–499. [PubMed: 21609893]
- Quinn GP, Vadaparampil ST, Jacobsen PB, et al. Frozen hope: Fertility preservation for women with cancer. *J Midwifery Women's Health.* 2010a; 55:175–180. [PubMed: 20189137]
- Quinn GP, Vadaparampil ST, Lowrey KM, Eidson S, et al. State laws and regulations addressing third-party reimbursement for infertility treatment: implications for cancer survivors. *Fert Ster.* 2010b; 15:1–7.
- Ries, LA.; Harkins, D.; Krapcho, M., et al. *SEER Cancer Statistics Review, 1975–2008.* Bethesda, MD: National Cancer Institute; 2008.
- Fertile Hope. Egg & Embryo Freezing. Sharing Hope Program for Women. Available at: <http://www.fertilehope.org/>.
- Shin D, Lo KC, Lipshultz LI. Treatment options for the infertile male with cancer. *J Natl Cancer Inst Monogr.* 2005; 34:48–50. [PubMed: 15784823]

- Silber S. Fresh ovarian tissue and whole ovary transplantation. *Semin Reprod Med.* 2009; 27:479–485. [PubMed: 19806517]
- Spar D, Harrington A. Building a Better Baby Business. 10 *MINN J L SCI & TECH.* 2009:41.
- Sigel, IE.; McGillicuddy-DeLisi, AV.; Goodnow, JJ., editors. *Parental Belief Systems: The Psychological Consequences for Children.* 2nd ed.. Hillsdale, NJ: Erlbaum; 1992.
- The Ethics Committee of the American Society for Reproductive Medicine Fertility Preservation and reproduction in cancer patients. *Fertil Steri.* 2005; 83:622–628.
- Upchurch D, Lillard L, Panis C. Nonmarital childbearing: Influences of education, marriage, and fertility *Demography.* 2002; 39:311–329.
- United Nations. The Universal Declaration of Human Rights. 1948; 16(1) Article Available at: External link <http://www.un.org/en/documents/udhr/index.shtml>.
- Veatch, RM. How Many Principles for Bioethics? In *Principles of Health Care Ethics.* John Wiley & Sons, Ltd.; 2007. p. 43-50.
- Zoloth L, Backhus L, Woodruff T. Waiting to be born: The ethical implications of the generation of “NUBORN” and “NUAGE” mice from pre-pubertal ovarian tissue. *Am J Bioeth.* 2008; 8:21–29. [PubMed: 18726776]