
Attitudes towards disposition of cryopreserved sperm in the event of death

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Introduction: To evaluate patient preference for sperm disposition in case of death based on demographic factors and infertility etiology.

Materials and methods: This retrospective cohort study was performed at a university hospital-affiliated fertility center. Charts of 550 men undergoing cryopreservation for assisted reproductive technologies (ART) between 2016-2019 were reviewed to create a descriptive dataset. Patients previously signed consent forms stating their preference for sperm transfer to their partner or disposal in the event of their subsequent death. Patients undergoing sperm cryopreservation for the purpose of ART were analyzed to assess associations between demographic characteristics and etiology of infertility and their choice to either transfer sperm to their partner or discard.

Results: A total of 84.9% (342/403) of patients included in final analyses elected to transfer their sperm to their partner in the event of their death. Factors associated with a significantly increased likelihood to transfer versus discard included a male-factor infertility diagnosis compared to female-factor infertility diagnosis (transfer rate 89.3% vs. 79.9%; $p = .022$) and commercial insurance coverage versus non-commercial/no insurance coverage (transfer rate 86.3% vs. 75.0%, $p = .029$). No significant differences relating to age, race/ethnicity, occupation classification, marital status or duration of marriage, or prior paternity were found.

Conclusion: A majority of male patients seeking sperm cryopreservation for ART elected to transfer their sperm to their partner if future death should occur. There does not appear to be a clear factor that would impact this decision based on demographic characteristics.

Key Words: infertility, male reproductive technology, assisted conception, posthumous, ethics

Introduction

Since the first reported case of a successful birth after in vitro fertilization (IVF) in 1978, IVF and other methods

of assisted reproductive technology (ART) have enabled successful pregnancies for many patients.¹ The advent of sperm cryopreservation preceded the first successful case of IVF by 25 years,² and advances in storage techniques have enabled cryopreservation to become a cornerstone in facilitating the ART process.^{3,4}

Patients cryopreserving sperm are presented with many unique considerations.⁵ One such consideration is the fate of the cryopreserved sperm in the event of the man's death. As sperm have demonstrated viability in attaining pregnancy as many as 40 years

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after cryopreservation, the window for possible paternity can extend well beyond a patient's death.⁶ It is important that individuals' wishes are respected after death, and it is similarly important that they have the assurance that their reproductive materials will not be used in a manner inconsistent with their expectations.^{7,8} Even if there is evidence that the deceased desired parenthood in life, he or she may not desire this posthumously. Historically, a lack of formalized guidelines has made navigating these topics difficult,⁹⁻¹² but newer guidelines from the American Society of Reproductive Medicine have helped to fill in these gaps to aid in decision-making.⁷

Men actively engaged in sperm cryopreservation for the purposes of ART are a population that can be queried regarding their reproductive objectives should death occur after sperm cryopreservation. The aim of this study is to evaluate consent forms of patients who have frozen sperm prior to undergoing ART to determine if male patients would choose to discard sperm or transfer to their partners in the case of death, and whether there are specific demographic or medical characteristics associated with either choice.

Methods and methods

This retrospective cohort study evaluated a population of patients undergoing ART for conception at a single fertility center affiliated with an academic institution. Approval for this study was granted by the Institutional Review Board (IRB) at our facility (approval #20-028R-2). Patients undergoing sperm cryopreservation at this facility completed a consent form documenting their preference for sperm disposal or transfer to their partner in the event of their death; 'transfer' in this context refers to transfer of ownership with the intent to use the cryopreserved sperm to create a pregnancy. All men cryopreserving sperm at this facility completed this consent form, regardless of the reason for cryopreservation (e.g. ART, fertility preservation).

Electronic medical records of patients cryopreserving sperm between January 2016 and October 2019 were reviewed. This represents the period of time for which all patient data points of interest, namely sperm disposition in the event of a patient's death, were available at the time of IRB approval. Patient demographic information, reason for sperm cryopreservation, and patient preference for sperm transfer or disposal upon their death were utilized to create a descriptive dataset of patients undergoing sperm cryopreservation. Collected information included age (at time of consent), type of insurance, occupation, occupation classification, marital status,

number of years married, race/ethnicity, reason for cryopreservation, whether the patient had prior biological children, whether the patient had a prior cancer diagnosis, and consent to transfer or discard sperm in the event of their death. "Reason for cryopreservation" was categorized as male-factor infertility, female-factor infertility, combined male/female factor infertility, or infertility of unknown/unspecified etiology. Determinations of infertility etiology were made by the treating infertility specialist. Categorization of demographic categories was made by the principal investigator. In our study, men cryopreserving sperm for the purposes of ART were sampled given the convenience of a large number of patients undergoing sperm cryopreservation.

This descriptive dataset was then analyzed. Patients included in the analysis were males ≥ 18 years old undergoing sperm cryopreservation or sperm retrieval for the purpose of ART who had completed the standard consent form documenting their preference for sperm disposal or transfer to their partner in the event of their death. Patients were excluded if they were younger than 18 years old, were cryopreserving sperm for a purpose other than ART (e.g. prior to chemotherapy, fertility preservation after vasectomy), or if they had not completed the standard consent form documenting their preference for sperm disposal or transfer to their partner in the event of their death.

Univariate analyses of the relationship of each of these factors and the attitudes towards posthumous sperm disposition were assessed. Continuous variables were assessed utilizing independent samples t-test; mean and standard deviation were used to describe continuous variables that conformed to assumptions of normality. Dichotomous and categorical variables were compared utilizing Pearson's chi-squared test (GraphPad).

Results

A total of 550 patient charts of men seeking cryopreservation of sperm were reviewed, of whom 403 met criteria for inclusion in final analysis. Patient demographics are listed in Table 1. Patients tended to be Caucasian, married, and have white collar jobs, commercial insurance, and no prior children.

Overall, 342/403 (84.9%) patients elected to transfer their sperm postmortem compared to 61/403 (15.1%) who elected to discard their sperm, Table 2. Two subsets of patients demonstrated a statistically significant increased likelihood to transfer versus discard their sperm: patients undergoing ART due to male-factor infertility when compared to patients undergoing ART

TABLE 1. Baseline patient characteristics

Patient characteristic	Number (%)
Age, mean \pm SD	38.2 \pm 6.7
Race/Ethnicity	
Caucasian	257 (64)
Black	43 (11)
Asian	49 (12)
Hispanic	32 (8)
Unknown/Other	22 (5)
Reason for cryopreservation	
Male-factor infertility	140 (35)
Female-factor infertility	186 (46)
Combined male/female	36 (9)
Unspecified	41 (9)
Marital status	
Married	349 (87)
Committed relationship	52 (13)
Mean # years married \pm SD	5.73 \pm 4.0
No prior children	233 (58)
Prior children, current partner	91 (23)
Prior children, prior partner	60 (15)
Unknown	19 (5)
Occupation classification	
Blue collar	137 (34)
White collar	227 (56)
Other/unknown	39 (10)
Commercial insurance	344 (85)
Non-commercial insurance	25 (6)
No insurance	31 (8)
Unknown	3 (1)
Total	403

due to female-factor infertility (125/140 [89.3%] vs. 151/189 [79.9%], $p = .022$) and patients with commercial insurance versus non-commercial/no insurance (transfer rate 297/344 [86.3%] vs. 42/56 [75.0%], $p = .029$). Conversely, patients undergoing ART for female-factor infertility, when compared to patients undergoing ART for all other causes, were found to elect to discard their sperm at higher rates (discard rate 38/189 (20.1%) vs. 23/214 [10.7%], $p = .007$).

There were no significant differences between patient preferences for transfer versus discard of sperm post-mortem associated with marital status or duration of marriage, having prior children, or occupation classification. Additionally, while differences were

present in transfer rates among patients of different racial/ethnic backgrounds (transfer rate amongst Caucasian patients: 86.8%; amongst Black patients: 83.7%; amongst Hispanic patients: 93.8%; amongst Asian patients: 77.6%), these differences were not statistically significant.

Discussion

Overall, 85% of men in our cohort elected to transfer their sperm to their surviving partner in the case of their death. This suggests that most men who are seeking paternity via ART would be comfortable with the use of their cryopreserved gametes for procreative purposes after their death.

Interestingly, men undergoing ART for male-factor infertility had higher rates of transfer than men undergoing ART for female-factor infertility. This finding could reflect an emotional obligation or feeling of responsibility to help their partner achieve pregnancy since the diagnosis of infertility was "male." In a study by Perez et al, men and women were surveyed after cancer diagnoses to evaluate infertility-related distress. Men were found to be distressed about how infertility might impact relationship satisfaction over women, supporting the idea that agreeing to posthumous use of sperm for ART might relieve this distress or possibly improve the perception of relationship strength.¹³

Another factor that significantly impacted attitudes towards post-mortem disposition of sperm was insurance status. Men with commercial insurance favored transfer of cryopreserved sperm to their partners over men who had non-commercial insurance or no insurance at all (86.3% vs. 72% vs. 74%, $p = 0.029$). Our findings may emphasize the high economic stakes of ART and raising a child. In the United States, the cost for one cycle of ART, as a percent of the average annual disposable income of a single person with no dependent children, was found to be over 50%, with a median cost per person for a single in vitro fertilization (IVF) cycle of \$24,373.¹⁴ This demonstrates the high expense that patients incur to undergo fertility treatments – especially in non-mandated states – and having insurance may cushion some of that financial burden. Additionally, patients with non-commercial insurance or no insurance might rely on a two-person income to afford fertility treatments such as in IVF and intracytoplasmic sperm injection that would need to be completed in the setting of posthumous use of cryopreserved sperm for ART. Furthermore, there are additional costs associated with storing cryopreserved specimens. Without one partner present, pursuing ART might not be financially feasible.

TABLE 2. Transfer versus discard of sperm in the event of death

Patient characteristic	Transfer	Discard	p value
Mean age	38.0 ± 6.6	39.1 ± 6.9	.255
Race/Ethnicity			.466 [§]
Caucasian	223/257 (86.8%)	34/257 (13.2%)	
Non-Caucasian	105/125 (84.0%)	20/125 (16.0%)	
Black	36/43 (83.7%)	7/43 (16.3%)	
Hispanic	30/32 (93.8%)	2/32 (6.3%)	
Asian	38/49 (77.6%)	11/49 (22.4%)	
Reason for cryopreservation			
Male-factor infertility	125/140 (89.3%)	15/140 (10.7%)	.019 [†] .061 [‡]
Female-factor infertility	148/186 (79.6%)	38/186 (20.4%)	
Combined male/female	31/36 (86.1%)	5/36 (13.9%)	
Unspecified	35/38 (92.1%)	3/38 (7.9%)	
Marital status			.228
Married	293/349 (84.0%)	56/349 (16.0%)	
Committed relationship	47/52 (90.4%)	5/52 (9.6%)	
Mean # years married	5.81 ± 4.0	5.26 ± 3.6	.369
No prior children	197/233 (84.5%)	36/233 (15.5%)	.678 ^{§§}
Prior children, current partner	79/91 (86.8%)	12/91 (13.2%)	
Prior children, prior partner	51/60 (85.0%)	9/60 (15.0%)	
Occupation classification			.871
Blue collar	115/137 (83.9%)	22/137 (16.1%)	
White collar	192/227 (84.6%)	35/227 (15.4%)	
Commercial insurance	297/344 (86.3%)	47/344 (13.7%)	.029 [*]
Non-commercial insurance	18/25 (72.0%)	7/25 (28.0%)	
No insurance	24/31 (77.4%)	7/31 (22.6%)	
Total	342/403 (84.9%)	61/403 (15.1%)	

Statistical significance considered to be $p < .05$. Continuous variables assessed with independent samples t-test. Dichotomous and categorical variables compared with Pearson's chi-squared test.

Denominators with totals < 403 indicate incomplete demographic data.

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[†]p value for male-factor vs. female-factor infertility patients; [‡]p value for all infertility diagnoses; [§]p value for Caucasian vs. Non-Caucasian; ^{§§}p value for no prior children vs. any prior children; ^{*}p value for patients with commercial insurance vs. all others.

Similarly, male patients may not wish to pass on the burden of ancillary expenses, such as storage fees, to their partners in the event of their death.

There was no difference in attitudes toward post-mortem disposition of sperm in couples who were married versus in a committed relationship (84% vs. 90.4% $p = 0.228$). However, both groups had equally been in their relationship an average of five years (5.81 ± 4.0 vs. 5.26 ± 3.6, $p = 0.369$) suggesting length of relationship may be more important than the type of the relationship in electing posthumous transfer of sperm. Furthermore, being childless versus

having previous children with their current partner or someone else did not impact attitudes towards post-mortem disposition of sperm.

Finally, transfer rates among patients of different racial/ethnic background varied slightly but differences were not statistically significant. Hispanic patients had the highest transfer rate at 93.8% and Asian patients had the lowest transfer rate at 77.6%. Both Caucasian and Black patients elected to transfer sperm approximately 85% of the time. This variation in transfer rates could reflect cultural and socioeconomic factors.

The findings of this study should be considered in the context of the prior, albeit limited data on the subject. In 2013, Pastuszak and colleagues published their analysis of a similar patient population who had undergone sperm cryopreservation between 2009 and 2011.¹⁵ Their patient population was slightly older compared to our study, with mean age of 40.1 ± 9.9 years in their infertility cohort. Out of 364 men included in their analysis, 85.9% consented to posthumous use of their sperm. This is consistent with our population in which 84.9% of men elected to transfer their sperm in the event of their death. In their study, relationship/marital status and prior paternity were predictors of an increased likelihood to allow post-mortem use of sperm. In our study, prior paternity status was not associated with an increased likelihood of consenting to postmortem sperm transfer. Patients who were not married or in a committed relationship were excluded from our analyses.

In 2020, Blachman-Braun and colleagues published data analyzing patient preferences for sperm transfer versus discard in men undergoing cryopreservation for reasons including fertility preservation (prior to treatment for cancer diagnoses), IVF back-up, and prior to vasectomy.¹⁶ Mean patient age of 35.8 years matched that of our descriptive dataset, and they additionally found a similar overall transfer rate of 81.1%. In their study, the decision to transfer versus discard sperm was associated with the reason for cryopreservation. Men cryopreserving sperm for IVF backup were the most likely to elect to transfer their sperm (89% transfer rate), followed by men cryopreserving sperm prior to cancer treatment (77% transfer rate) and men cryopreserving sperm prior to vasectomy (47%).¹⁶ Age and method of sperm retrieval were not associated with rates of transfer versus discard of sperm. If cryopreservation for IVF is interpreted as a desire for parenthood – whereas election to undergo vasectomy is interpreted as not desiring parenthood – then the differences in transfer rates seen in this study could suggest that desire for future parenthood may be reflective of men's preferences for transfer or discard of their sperm in the event of their death.

Our study is strengthened by its sample size. The construction of this dataset was uniquely facilitated by having access to a large volume of patient records in which the question of whether or not a particular patient would choose to transfer or discard his sperm in the event of his death was already answered. Another strength of this study was the inclusion of potential surrogate markers of patient attitudes to posthumous sperm disposition that are typically available to healthcare professionals.

Our study has limitations. Retrospective chart review is prone to selection biases, and this patient population – patients cryopreserving sperm prior to procreative attempts through ART – represents a cohort whose results may not be generalizable to other men in the community.

In our study, men cryopreserving sperm for the purposes of ART were sampled given the convenience of a large number of patients undergoing sperm cryopreservation. However, men willing to cryopreserve sperm for the purpose of ART may have different attitudes towards the post-mortem use of their sperm than other men in the community. Additionally, while our database represented a large number of patients to analyze, some data was likely not fully able to be captured. For example, 'duration of marriage' is an included item for married patients, but this may not truly capture accurate data on relationship duration, particularly for un-married couples.

Finally, although the sample size was a relative strength of the study, it was not large enough to identify significant differences in trends that may exist in patient attitudes towards posthumous use of cryopreserved sperm amongst different racial and ethnic groups.

Future evaluation of this population may benefit from further analysis. The reasons that individual men give for electing to transfer versus discard their sperm in the event of their death should be elucidated, and explored to assess how this may relate to this cohort's tendencies. This research question could ultimately be extended to explore factors influencing men's willingness to allow posthumous assisted reproduction, a moral and practical dilemma that is outside the scope of this paper.^{12,17,18}

Conclusions

Eighty-five percent of all patients in this cohort elected to allow post-mortem transfer of their sperm to a surviving partner. When considering which patients would elect to transfer or discard their sperm in the event of their death, trends exist that may suggest patient preference in the absence of explicitly expressed wishes. Patients seeking sperm cryopreservation for ART due to male-factor infertility, as well as patients with commercial insurance, were significantly more likely to allow their sperm to be transferred in the event of their death. Further studies are needed to better characterize the causes and strengths of these associations in assessing men's attitudes towards the posthumous disposition of their sperm. □

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