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Fertility patients' views about frozen embryo disposition: Results of a multi-institutional U.S. survey

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Capsule: Fertility patients prefer disposition options not available to them or find available options unacceptable. The informed consent process should be restructured and standardized, and all disposition options should be made broadly available.

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Abstract

Objective—To describe fertility patients' preferences for disposition of cryopreserved embryos and determine factors important to these preferences

Design—Cross-sectional survey conducted between June 2006 and July 2007

Setting—Nine geographically diverse U.S. fertility clinics

Participants—1020 fertility patients with cryopreserved embryos

Interventions—Self-administered questionnaire

Main Outcome Measures—Likelihood of selecting each of five conventional embryo disposition options: store for reproduction, thaw and discard, donate to another couple, freeze indefinitely, and donate for research; likelihood of selecting each of two alternative options identified in previous research: placement of embryos in the woman's body at an infertile time, and a disposal ceremony; importance of each of 26 considerations to disposition decisions; and views on the embryo's moral status.

Results—54% of respondents with cryopreserved embryos were very likely to use them for reproduction, 21% were very likely to donate for research, 7% or fewer were very likely to choose any other option. Respondents who ascribed high importance to concerns about the health or well-being of the embryo, fetus, or future child were more likely to thaw and discard embryos or freeze them indefinitely.

Conclusions—Fertility patients frequently prefer disposition options not available to them or find available options unacceptable. Restructuring and standardizing the informed consent process and ensuring availability of all disposition options may benefit patients, facilitate disposition decisions and address problems of long term storage.

Keywords

Cryopreserved embryos; frozen embryos; embryo disposition; informed consent; discarding embryos; embryo donation; embryo research; ethics

Introduction

Nearly every US fertility clinic offers embryo cryopreservation to patients undergoing in vitro fertilization (IVF)(1,2). Most patients elect cryopreservation in hopes of increasing their chances of conception through frozen embryo transfer (FET) if fresh cycles fail to meet their needs. Yet, fresh embryos are used in more than 80% of IVF cycles(2). A pressing consequence is that hundreds of thousands of embryos have accumulated(3) and have generated difficult challenges for patients, physicians, and embryologists. A central challenge has been decision making about the disposition of excess embryos, either by donation for scientific research or embryologist training, donation to other couples for reproductive use, or discarding embryos not needed for reproduction.

In the last decade, disposition of embryos remaining after IVF has been portrayed primarily as a public matter, in particular, through the vigorous debate over the ethics of using public funds for stem cell research requiring embryo destruction(4,5). Yet for patients, disposition of cryopreserved embryos is a decidedly private matter, requiring deliberation some describe as a difficult, even "agonizing"(6) choice among unsatisfactory or unacceptable options(7). As many as 70% of patients with embryos delay their decisions five years or more(8), some

indicating they would do so indefinitely(6). In addition to reflecting patients' burdens, delayed decisions create difficulties for providers responsible for safe storage or disposition of apparently abandoned embryos(9· 10). Understanding the considerations that inform and hinder timely disposition of embryos by fertility patients is both critical to the ethical debate about embryo research and necessary to the development of guidelines aimed at addressing the accumulation of stored embryos.

Studies addressing patients' perspectives on embryo disposition are limited. Qualitative research on patients' perspectives on embryo disposition has identified several considerations that influence patients' decisions about embryo disposition(6· 7· 11· 12), yet little is known about the prevalence of patients' views. Quantitative studies are limited by small sample size, low response rates, and/or sampling from a single clinical site(13·18). To address these limitations, quantify preferences for embryo disposition and factors informing these preferences, and inform clinical care for fertility patients, we surveyed a large and geographically diverse U.S. sample of fertility patients with cryopreserved embryos. This investigation was conducted to determine individuals' preferences for disposition and correlate them with demographic characteristics, attitudinal factors, and views on the moral status of human embryos.

Materials and Methods

Between June 2006 and July 2007 a confidential 12-page questionnaire was mailed to 2210 patients receiving care at one of nine geographically diverse U.S. fertility centers. Up to 300 potential participants were randomly selected from each center's database of patients with currently stored embryos using a standardized Excel-based randomization and selection protocol. The first two-thirds of questionnaires were sent to the woman intending to become pregnant from IVF and the remaining one-third were sent to the woman's partner (male or female) when information on partner status was available. Surveys were sent purposefully to only one individual (the woman *or* her partner) per couple. We used several well-established techniques to maximize response rates(19), including a nominal financial incentive (\$2), a reminder call, and a second survey approximately four weeks after the initial mailing. The study was approved by institutional review boards of all academic centers. Methodology for this study has been described elsewhere(20).

Measurements

This questionnaire was preceded by a qualitative study that included 46 in-depth interviews with more than 50 male and female fertility patients facing disposition decisions about cryopreserved embryos(7). This previous study identified seven factors affecting fertility patients' decisions about cryopreserved embryos. These data served as the basis for questionnaire language and content. Questionnaire items were then evaluated and revised based on seven cognitive interviews(21) with fertility patients in which understanding and interpretation of questions were evaluated during questionnaire administration. Questions were refined following review by an expert panel including fertility specialists and survey methodologists.

Primary variables for analysis were patients' responses to the question: "In terms of how you feel right now, how likely or unlikely are you to choose the following options for your embryos?" Previous qualitative data and cognitive interviews indicated that asking patients to rank their likelihood of choosing each option would be a useful way to characterize current preferences in the setting of ongoing decision making. Therefore, using response categories of very likely, somewhat likely, somewhat unlikely, very unlikely, and unsure/don't know, respondents with currently stored embryos indicated likelihood of choosing each of five conventional options: (1) store for future pregnancy attempts; (2) thaw and dispose of embryos;

(3) donate to another couple trying to have a baby; (4) keep the embryos “frozen forever” (a term articulated by participants in the prior interviews); and (5) donate the embryos to research. Two additional variables assessed respondents' preferences for alternative options suggested previously by in-depth interview participants: “Please indicate how likely or unlikely you would be to choose the following options for your embryos if they were available: having the embryos put in my body/my vagina at a time in my cycle when I would probably NOT get pregnant; being present at a small ceremony that could occur during thawing and disposal of my embryos,” referred to hereafter as ‘compassionate transfer’ and a ‘disposal ceremony,’ respectively. We distinguished conventional from alternative options, as the former are offered by a majority of clinics in the United States, and the latter are offered by a small minority (<5%) of clinics(22). Respondents were not required to choose among options, as our previous qualitative work indicated that many patients with embryos stored had not made a final decision about disposition. Respondents without embryos currently stored were directed to skip these questions, since their relevance depended on ongoing decision making about existing embryos. Current consent documents from participating centers were also reviewed to assess local access to options for embryo disposition (Table 1).

Our previous qualitative work indicated that reasoning about embryo disposition evolves according to whether patients desire more children(7). To elicit reproductive intent, the questionnaire asked respondents to choose among three options to describe their current thinking about childbearing: “I hope to have a baby/another baby; I am undecided about whether or not I want to have a baby/another baby; I am sure that I do not want to have a baby/another baby.”

To assess potential attitudinal predictors of disposition options, the questionnaire asked respondents to rate the importance of twenty six considerations generated from prior in-depth interviews(7). Respondents rated the importance of each consideration according to response categories: very important factor, somewhat important factor, not very important factor, factor not important at all, and factor not applicable to me.

The questionnaire assessed views about the moral status of human embryos with a scale previously developed and used on a large population sample(23). Following a detailed description of what is meant by “moral status,” respondents were asked, “On a scale from 1 to 7 where ‘1’ means ‘No moral status’ and ‘7’ means ‘Maximum moral status’ please check a number that indicates what you believe to be the moral status of human embryos.” Questions about demographics and IVF and reproductive history also were included.

Analysis

Analyses were based on the number of patients and partners who indicated that they currently had embryos in storage. Individuals without embryos were excluded as they did not answer questions on which the main outcome measures were based. We examined frequencies of responses for demographics, seven embryo disposition options, views on moral status, views on childbearing, and considerations important to disposition decisions. Crosstabs were used to describe likelihood of choosing each option by views on childbearing. To identify broad domains important to patients' decisions about embryo disposition, a principal components analysis (PCA) was conducted with promax rotation. The scree plot and Eigenvalues suggested a four-component solution, from which component scores were created (see Results). In creating component scores, all missing responses were replaced by the mean of the items within each component to which respondents assigned an importance rating.

To determine considerations associated with embryo disposition options, we conducted multivariable logistic regression analyses. Responses to the seven disposition options were dichotomized into two categories, likely and unlikely. The response “Unsure/don't know” was

coded as missing, and sensitivity analysis was performed to determine the relationship between demographic variables and choosing this response option. In separate logistic regression models, preferences for options were regressed on: (1) demographic and clinical variables (2) the four factor domains identified through the PCA, and (3) views on moral status. The linearity assumption of all continuous independent variables was checked using the Box-Tidwell procedure. Variance inflation factors and tolerance were examined for each independent variable to ensure that multi-collinearity was not present. Hosmer-Lemeshow goodness of fit statistics indicated that all models provided sufficient fit to the data. To reduce capitalization on chance, a significance criterion of $p \leq .01$ was used. Findings are reported as odds ratios for each increase in one unit. Analyses were performed with SAS version 9 (SAS Institute, Cary, NC).

Results

Of 2210 potential subjects mailed surveys, 5% were ineligible because they had relocated and were unreachable or died. Of the remaining 2088 potential subjects, 1244 returned the survey yielding an overall response rate of 60% (63% for women and 51% for partners). Of these, 82% (1020) indicated they currently had embryos stored. The sample was homogenous and socioeconomically advantaged: of 1020 with embryos, 85% were white, 95% were married, and 79% had a bachelor's degree; 75% had already succeeded in having children from IVF (Table 2). Key outcomes did not differ on the basis of gender. Non-respondents tended to be older, less likely to be Caucasian, and more likely to be the partner than the woman intending pregnancy. Weighting was not performed as variables did not differ significantly on key outcomes. Sensitivity analysis revealed no significant differences between demographic variables and likelihood of choosing "unsure/don't know", except that non-whites were more likely than whites to be unsure about the option of reproductive donation.

Preferences regarding options for embryo disposition

Of the 1020 respondents with cryopreserved embryos, approximately 54% were very likely to use embryos for future pregnancy attempts while 21% were very likely to donate embryos for research (Table 3). Fewer than 7% were very likely to choose any of the other five options for embryo disposition, while a majority was very unlikely to choose any of these options, including thaw and discard (55%), reproductive donation (59%), freezing forever (64%), compassionate transfer (64%), or a disposal ceremony (62%). In contrast, only 31% were very unlikely to choose research donation.

Disinclination toward disposition options was high whether or not future pregnancy was desired (Table 3). Nearly half (49%) of respondents were either undecided about whether they wanted (30%) or certain they did not want (19%) a baby or another baby. Of respondents in these two categories (N=499), only 60% said that they were "very likely" to choose any of the standard options (use for future reproduction, thaw and discard, reproductive donation, research donation, freezing indefinitely), leaving 40% who were not "very likely" to choose one of the five standard options. Of the latter, 8% would be very likely to choose compassionate transfer, and 13% would be very likely to choose a disposal ceremony. Of those certain they did not want a baby (n=193), 41% considered research donation very likely, compared with smaller numbers who considered reproductive donation (16%) or thaw and discard (12%) as very likely options. Correspondingly, a significant proportion of those certain they did not want a baby were very unlikely to choose the options of thaw and discard (43%), reproductive donation (53%), freezing forever (64%), compassionate transfer (70%), or a disposal ceremony (60%), contrasting with 18% who were very unlikely to donate for research.

To further explore factors influential in disposition preferences we reviewed responses to 26 considerations. Four considerations were rated as important to disposition decisions by three-

quarters of respondents, including: (1) wanting to help find cures for diseases like Alzheimer disease, (2) not wanting someone else to whom I could donate my embryos raising my genetic child, (3) my feeling that thawing and discarding is wasteful, and (4) my partner's/spouse's opinion about what to do with the embryos. All 26 considerations were somewhat or very important to at least 20% of respondents, and most (15 of 26) considerations were somewhat or very important to more than half (Table 4).

Next, we examined whether 26 individual attitudinal items constituted cohesive domains. The principal components analyses (PCA) of these 26 attitudinal considerations yielded four components accounting for 47% of the variance. Items were retained that loaded $> .40$ on the primary factor and $< .30$ on the other factors (Table 4). Thematic relationships between items in each of the components suggested four domains: (1) concerns about a woman's physical or emotional health; (2) concerns about the embryo, potential fetus or child; (3) altruism; and (4) concerns over family and financial issues.

Responses to the question about moral status of human embryos indicated a wide range of views. While approximately 28% indicated views at either end of the spectrum (10% ascribed no moral status and 18% ascribed full moral status to human embryos), most respondents held an intermediate view.

Considerations relevant to preferences

Respondents' views about moral status of embryos correlated significantly with six of seven disposition options (Table 5). Those ascribing high moral status to human embryos were more likely to use their embryos for future pregnancy attempts, donate embryos to another couple, or choose an alternative disposition option (compassionate transfer or a disposal ceremony). In contrast, those ascribing lower moral status to human embryos were more likely to thaw and discard embryos or donate them for research.

Three of the four domains (concern about the embryo, future fetus or child; altruism; and woman's health) were significantly associated with disposition preferences. Respondents ascribing high importance to concerns about the embryo, fetus or future child were more likely to thaw and discard embryos, freeze embryos indefinitely, elect compassionate transfer, or have a disposal ceremony; this subset was less likely to donate embryos to another couple. Those ascribing high importance to the domain of altruism were more likely to donate embryos either to research or to another couple, and less likely to thaw and discard them. Those ascribing high importance to concerns about the woman's health were more likely to choose a disposal ceremony and less likely to use embryos for future pregnancy attempts.

Only three demographic factors (number of children, length of time stored, and race) were associated with preferences for embryo disposition. Respondents without children were more likely than those with children to use embryos for future pregnancy attempts. Those with embryos stored >5 years were more likely to thaw and discard or freeze embryos indefinitely, and less likely to use embryos for future pregnancy attempts than those who had stored embryos for shorter time periods. When racial categories were dichotomized into "white" and "non-white," white race was associated with freezing indefinitely.

Discussion

In IVF programs, excess embryos are almost always cryopreserved in order to safely and efficiently maximize the chances of pregnancy. Yet, embryos have accumulated worldwide and now number in the hundreds of thousands(3, 24). This study quantitatively assessed the intentions and attitudes of a geographically diverse U.S. sample of fertility patients toward cryopreserved embryo disposition. It revealed that fertility patients are likely to face an

unanticipated conundrum when they have completed treatment: a choice among unappealing disposition options. In our sample, nearly half of currently stored embryos are not intended for reproduction, but good alternatives for embryo disposition are lacking: patients either prefer options not generally available to them, such as research donation, or reject available options, including reproductive donation or thawing and discarding. The factors that shape these preferences were identified, including a novel conception of responsibility that correlated with options resulting in embryo destruction.

In contrast to a recent national survey indicating that 87% of embryos are being stored for “patient treatment,”⁽³⁾ we found that only 67% of patients were likely (54% very likely) to use embryos for reproduction. More consistent with previous estimates, 86% of the subset of respondents wanting a baby was very likely to use embryos for reproduction. This differential reflects that reproductive decision making is a dynamic process: many patients who initially freeze embryos for reproductive purposes find that they no longer need them after becoming pregnant through IVF with fresh embryos or conceiving spontaneously (at an estimated rate of 12.5% over 36 months)⁽²⁵⁾, or no longer want them due to changes in reproductive goals and life situation. Yet of the nearly 500 respondents not desiring future childbearing, 40% have yet to select a preferred disposition option, and nearly a fifth indicate they are likely to freeze their embryos indefinitely.

Our data point to a breadth of barriers to embryo disposition, including challenges that arise in the process of decision making, issues concerning the options themselves (availability and acceptability), and barriers to carrying out options once they are identified as preferable. An important challenge in the process of decision making is that when embryos are initially cryopreserved, patients are focused on having a child and may not be prepared to consider fully their views about embryo destruction or donation.⁽⁷⁾ Of the subset of individuals in our study who indicated intentions to have a baby, few think it very likely they will dispose of excess embryos: only 3-6% of respondents considered any disposition option very likely, with the notable exception of research (15%). Rather than delaying disclosure, consent for cryopreservation should acknowledge difficulties some patients have deciding among disposition options and, given that reproductive goals evolve, incorporate a system to revisit disposition preferences at regular intervals. Updated information on available options can be included in regular billing correspondence from IVF centers to patients with stored embryos. Given the complex nature of this process, standardized procedures and documentation for informed consent and interval follow-up should be developed.

A related challenge is that patients facing disposition decisions frequently prefer options that are not made available to them. Consistent with single site studies from Europe and Australia⁽²⁶⁾, donation for research was the most popular option for disposition of excess embryos; considerably fewer respondents elect reproductive donation, or thawing and discarding. Yet only four of nine participating centers mention the possibility of research donation in consent documents for cryopreservation. In fact, our review of consent documents indicates that patients are often not asked their preference regarding disposition of excess embryos at the time of freezing. In these programs, consent for disposition happens at the time of donation or disposal. Discussion of disposition options is not mandated by professional guidelines. There are only two factors listed for discussion in the American Society for Reproductive Medicine's guidelines for frozen embryo disposition informed consent: the program's time limit, and disposition in the event of death, divorce, nonpayment, or loss of contact⁽²⁷⁾. While such guidance was adopted partially in response to legal disagreements over cryopreserved embryos, guidelines should be updated to encourage early disclosure and periodic follow-up conversations about disposition options for cryopreserved embryos.

Another challenge to embryo disposition is that alternatives to research donation are not acceptable to most patients. Consistent with previous studies(14, 28, 29), few patients in this study were very likely to choose the option of reproductive donation, despite federal funding in support of reproductive donation programs(30) and avoidance of the perceived moral pitfalls associated with embryo destruction. Only 7% of participants indicated that they are very likely to choose reproductive donation; in contrast 59% were very *unlikely* to choose this option. Our data help to explain the reluctance toward reproductive donation. The principal components analysis captured a domain that has previously not been measured, which we called “concerns for embryo, potential fetus or child.” Eight factors loaded on this domain; seven were thematically linked as fertility patients' expressions of “parental” responsibility – concern about or responsibility for the health or welfare of the embryo or the child it could become. Interestingly, this broadly endorsed domain was negatively associated with reproductive donation and positively associated with options not resulting in a child, including thawing and discarding and freezing embryos indefinitely. These findings highlight the necessity of offering options that result in embryo destruction, or limiting the numbers of embryos created or cryopreserved by screening embryos for quality prior to freezing. Going forward, public policy discussions about embryo disposition practices should broaden their scope to incorporate patients' notions of procreative responsibility.

The option of thawing and disposal was widely available but unattractive. This option was considered very likely by only 6% of respondents despite the fact that it is offered at all centers. Our data also help to explain reluctance toward disposal. Our principal components analysis captured a domain of altruism, which was positively associated with donation for research and donation to another couple, and negatively associated with thawing and discarding. Thus the powerful impulse to give back to society and to help others may make research morally preferable to individuals whose sense of responsibility precludes their allowing their embryos to become children in any family except their own. For those less strongly moved by the particular and intimate sense of responsibility, altruism leads them to donate embryos to another couple.

Our data also reflect the importance to patients of the actual process of thawing and discarding embryos, including a demand for ritual. A significant minority of patients preferred transfer of embryos to the woman's body at an infertile time or a disposal ceremony. These options, articulated in greater detail in our previous qualitative work(7), were considered likely by almost as many respondents as the conventional options of thawing and discarding and reproductive donation. In contrast to conventional options, these alternatives are offered at less than 5% of U.S. clinics(22) and were not mentioned on any center's consent document. Interestingly, these options were preferred by patients who both ascribed higher moral status to human embryos and higher importance to concerns about the embryo, fetus and future child. In order to limit increasing numbers of stored embryos, clinicians and policy makers should work to ensure that patients have access to a breadth of options, including research, reproductive donation, and alternative methods of thawing and discarding.

Finally, the popular option of research donation exemplifies challenges to carrying out preferred options. While 64% of U.S. programs indicate they offer donation for embryo research to their patients(22), in reality this number may reflect what is likely to be an overestimate of the percentage of patients who actually have access to their preferred option. U.S. federal funding of research involving the destruction of embryos is currently restricted; therefore, U.S. scientists who rely solely on federal funding for their research may be unable to accommodate patients' demand for research donation unless these restrictions are lifted. In addition, research programs with other funding sources may currently face strict guidelines for informed consent. For instance, professional guidelines for stem cell research offered by the National Academies of Science(31) and by the International Society for Stem Cell Research

(32) include robust provisions regarding provenance of gametes and embryos. These stipulations include informed consent from gamete donors, sanctions against the research use of embryos created using paid oocyte donors, and a requirement for explicit consent for stem cell research or specific research projects. In some institutions, consent must be obtained for donation to each individual research project, rather than for embryo research in general. Even if consent is obtained, the logistics and high cost of shipping embryos to research centers remains a barrier. Further, some patients may live in jurisdictions where embryo research is illegal. If effective therapies emerge from research involving human embryos, donation to research may become a more attractive option, and issues of access may become more pressing. Patients opting for the less popular option of reproductive donation face similar barriers, as FDA policy on infectious disease testing may preclude reproductive donation of embryos created before its requirement for extensive testing of gamete providers was established.

Although the nine centers that agreed to participate in this investigation are diverse with respect to geographic location, size, insurance mandates, and affiliation with academia and fellowship programs, patients treated at academic centers were overrepresented, and generalizations should be made with care. This consideration highlights a limitation of such a study. Nevertheless, this is the largest and only multi-site study directly measuring fertility patient preferences for disposition of cryopreserved embryos in the U.S., Australia, or Europe. In addition, since the study focused on individuals who currently have embryos stored, our findings may not reflect views of patients who have disposed of embryos or transferred them to a commercial storage facility. However, given the challenges that currently stored embryos entail for both clinicians and policymakers, we chose to focus on the views of individuals in a position to decide about the embryos that have accumulated. Finally, although our sample tends to reflect the homogeneous population that currently has access to fertility services, the study group is lacking in socioeconomic and racial diversity, thus limiting power to demonstrate significant differences in attitudes and preferences according to racial, ethnic, or socioeconomic characteristics. In demographic considerations, the only statistically significant difference was that non-whites were less likely than whites to keep embryos frozen forever. Future studies should focus on and elicit the attitudes and preferences of minorities with regard to reproductive decisions, so that their voices also inform clinical care and policy in reproduction and embryo research. Given the unacceptability of currently available options, future studies should also investigate what other disposition options would be more acceptable to women and men participating in IVF.

Notwithstanding these limitations, this study has important implications for clinical care and guidelines for embryo disposition. Many fertility patients will face a difficult and unexpected conundrum regarding embryo disposition. The options they face are either unacceptable to them, or other options which would be acceptable are not available. Too often the result is delayed decision making, the accumulation of excess embryos, and burdens for patients and providers alike. Strategies to address this situation include attention to informed consent processes for patients undergoing IVF, including early disclosure about the potential for excess embryos, more detailed disclosure about the available disposition options, and periodic follow-up including discussions with patients regarding evolving reproductive goals and values. In addition, broad availability of all options including thawing and discarding, reproductive donation, research donation and considerate processes for disposal is a critical goal to be facilitated at the levels of public policy and clinical care. In addressing federal restrictions on embryo research, policymakers should consider their impact on fertility patients faced with morally difficult disposition decisions. Programs not institutionally affiliated with embryo research or reproductive donation programs may coordinate with other programs that can accommodate patients' preferences when disposition decisions are made. Additionally, individual programs should develop protocols for considerate processes for disposal. These changes may not only reduce the numbers of embryos in storage and help to advance biomedical

science, but may also facilitate disposition decisions that are morally acceptable to the majority of fertility patients. In the meantime, this study clearly reveals that individuals with cryopreserved embryos express considerable – and previously unexplored – concerns about the fate of their embryos. The results of this study emphasize the need for intensive restructuring of the informed consent process for infertility treatment that involves embryo cryopreservation.

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Table 1

Options listed in informed consent documents of participating centers

Embryo Disposition Option	Listed as option in informed consent document (listed/total)
Thaw and Discard	9/9
Donation for Research	4/9
Donation to another couple	3/9
Embryos placed in body at infertile time	0/9
Disposal ceremony	0/9
Freeze forever	0/9

Table 2

Demographic and Fertility Characteristics of the 1020 Survey Respondents With Embryos Currently Stored*

Demographic Characteristic	Number (%)	Fertility Characteristic	Number (%)
Female sex	795 (78)	Number of embryos	
Race		1-2	271 (27)
White	853 (85)	3-5	365 (37)
Asian	62 (6)	6-10	220 (22)
African American	44 (4)	11 or greater	103 (10)
Other	40 (4)	Unsure	41 (4)
Latino ethnicity	19 (2)	Longest time stored	
Age		Less than 1 year	262(26)
30 years or less	94 (9)	1-3 years	549(55)
31-35	303 (30)	4-5 years	101(10)
36-40	345 (34)	Greater than 5	87 (9)
>40 years	269 (27)	IVF pregnancies	
Married	975 (95)	0	115 (12)
Partner's age		1	667 (67)
30 years or less	65 (6)	2	161 (16)
31-35	283 (28)	3 or more	55 (6)
36-40	325 (32)	Number of Children	
>40 years	332 (33)	0	197 (19)
Level of Education		1	366 (36)
Less than HS	3 (<1)	2	323 (32)
HS diploma	120 (12)	3 or more	117 (12)
Associate's	88 (9)	Children from IVF	
Bachelor's	359 (36)	0	253 (25)
Graduate	431 (43)	1	420 (41)
Religion		2	290 (29)
Protestant	287 (29)	3 or more	44 (4)
Roman Catholic	239 (24)		
Other Christian	188 (18)		
Jewish	37 (4)		
Muslim	12 (1)		
None	166 (17)		
Other	54 (5)		
Fundamentalist (y/n)	84 (10)		

* Numbers do not all sum to 1020 because not all respondents answered all questions.

Table 3

Fertility patients' likelihood of choosing option for embryos currently stored according to current thinking about future childbearing

Please indicate how likely or unlikely you are to choose each of these options for your frozen embryos:	Very Unlikely (%)	Somewhat unlikely (%)	Somewhat likely (%)	Very likely (%)
Store for future pregnancy attempts (total)	20	9	13	54
Want baby	3	2	7	86
Unsure whether want baby	11	20	29	33
Don't want baby	82	12	3	3
Thaw and dispose of embryos (total)	55	12	18	6
Want baby	65	12	12	4
Unsure whether want baby	44	13	27	6
Don't want baby	43	11	24	12
Donate to another couple trying to have a baby (total)	59	11	15	7
Want baby	61	10	15	5
Unsure whether want baby	59	14	14	6
Don't want baby	53	9	18	16
Keep embryos frozen forever (total)	64	12	10	4
Want baby	69	11	8	3
Unsure whether want baby	56	15	12	5
Don't want baby	64	13	14	6
Donate the embryos for research (total)	31	10	27	21
Want baby	39	12	25	15
Unsure whether want baby	23	10	35	20
Don't want baby	18	7	25	41
Having the embryos put in	64	8	12	7

Please indicate how likely or unlikely you are to choose each of these options for your frozen embryos: my body at a time in my cycle when I would probably NOT get pregnant (total)	Very Unlikely (%)	Somewhat unlikely (%)	Somewhat likely (%)	Very likely (%)
Want baby	65	8	12	6
Unsure whether want baby	58	11	16	8
Don't want baby	70	8	10	8
<hr/>				
Being present at a small ceremony that could occur during thawing and disposing of my embryos (total)	62	10	11	7
Want baby	67	10	9	5
Unsure whether want baby	57	13	14	9
Don't want baby	60	10	14	10

Table 4
Grouping of and importance of factors important to decisions about cryopreserved embryos

Principal Components and Corresponding Survey Items	SL*	Importance (%)			Very
		Not at all	Not very	Some what	
Concerns about the woman's health					
My view that I should not be pregnant after a certain age	.69	33	20	22	12
My view that after a certain age I or my partner should not be a parent	.61	38	23	17	7
The impact that more IVF cycles could have on my health	.82	18	20	28	23
The emotional stress of more IVF cycles	.61	15	19	32	27
The impact that a multiple pregnancy could have on my physical health	.79	13	22	31	25
The impact that a pregnancy could have on my physical health	.82	20	24	30	19
Concerns about embryo, fetus or potential child					
My concern that infertile couples to whom I could donate embryos are not screened well enough	.49	17	19	23	23
The feeling that I am responsible for the well being of any child that could result from my embryos	.41	10	13	23	45
My concern that researchers to whom I could donate embryos would allow the embryo to develop into a baby	.71	16	17	18	38
Concern about the possibility of my stored embryo being transferred to another woman without my knowledge	.80	19	25	19	30
The possibility that the embryo could get damaged in the storage facility	.79	18	31	25	20

Principal Components and Corresponding Survey Items	SL*	Importance (%)			
		Not at all	Not very	Some what	Very
The possibility of birth defects in a pregnancy resulting from my frozen embryos	.65	15	25	27	27
My concern about what would happen to the frozen embryos if something happened to me before I were to use them	.73	19	28	26	21
My view that none of the options where I store my embryos seems acceptable to me	.57	23	22	11	9
Altruism					
Wanting to help other infertile couples become pregnant (donate to another couple trying to have a baby)	.80	14	17	32	22
Wanting to help other infertile couples become pregnant (donate frozen embryos for research)	.76	11	13	32	32
Wanting to help find cures for diseases like Alzheimer's or diabetes	.45	7	7	25	52
Concerns about family/finances					
The size of my family	.62	12	12	26	44
The impact that a multiple pregnancy could have on my family	.59	18	20	30	27
The financial cost of having additional fresh cycles of IVF	.71	16	18	26	29
The financial cost of raising additional children	.78	22	27	30	17
The financial cost of frozen embryo transfer	.64	28	34	22	11
Independent factors					

Principal Components and Corresponding Survey Items	Importance (%)			
	SL*	Not at all	Not very	Some what
Wanting to preserve my ability to get pregnant as I get older		29	18	24
Not wanting someone else to whom I could donate my embryos raising my genetic child		7	11	21
My feeling that thawing and discarding is wasteful		8	12	26
My partner's/spouse's opinion about what to do with embryos		7	8	21
				60

* Standardized loading. Items retained in domain were those that loaded > .40 on the primary factor and < .30 on the other factors

Table 5
Factors predictive of being somewhat or very likely to choose standard and alternative disposition options

Disposition Option	Views on moral status of human embryos	Domains			Demographic factors ^a		
		Woman's Health	Concerns about embryo	Altruism	Family/finances	Childless ^b	Embryos stored > 5 years ^c
Future pregnancy	1.21* [1.06, 1.38]	0.93* [0.89, 0.98]	1.05 [1.00, 1.09]	0.96 [0.88, 1.06]	0.96 [0.90, 1.03]	4.54* [1.59, 12.93]	0.26* [0.12, 0.56]
Thaw and dispose	0.70* [0.61, 0.81]	1.04 [0.99, 1.10]	1.08* [1.04, 1.13]	0.81* [0.73, 0.89]	1.08 [1.00, 1.16]	0.94 [0.34, 2.57]	4.32* [1.98, 9.43]
Donate to another couple	1.35* [1.16, 1.56]	0.98 [0.93, 1.03]	0.92* [0.88, 0.96]	1.46* [1.30, 1.64]	1.08 [1.01, 1.15]	0.87 [0.32, 2.41]	0.72 [0.29, 1.79]
Freeze forever	1.16 [1.00, 1.35]	1.07 [1.01, 1.13]	1.08* [1.03, 1.13]	0.93 [0.84, 1.03]	1.00 [0.92, 1.07]	0.47 [0.14, 1.56]	3.71* [1.68, 8.20]
Donate to Research	0.69* [0.60, 0.79]	1.01 [0.96, 1.07]	0.96 [0.92, 1.01]	1.65* [1.47, 1.85]	1.09 [1.01, 1.17]	2.13 [0.81, 2.36]	1.10 [0.47, 2.60]
Back in body	1.32* [1.14, 1.53]	1.00 [0.94, 1.05]	1.08* [1.04, 1.13]	0.95 [0.86, 1.05]	1.00 [0.93, 1.08]	0.52 [0.18, 1.52]	0.85 [0.34, 2.08]
Ceremony	1.27* [1.10, 1.47]	1.08* [1.02, 1.13]	1.07* [1.02, 1.12]	0.99 [0.90, 1.10]	1.01 [0.94, 1.10]	0.84 [0.29, 2.38]	1.62 [0.70, 3.73]
							0.94 [0.48, 1.80]

^aFactors included are only those that were statistically significantly related to any of the seven disposition options. Items with * had a p-value < or = 0.01.

^bORs reported here compare 0 children to 1 or more children (people who are childless v. people with child/ren)

^cORs reported here compare those with embryos stored >5 years vs. those with embryos stored 5 years or less.