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Getting eggs 'out of the basket': facilitating decisions about surplus frozen eggs

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ABSTRACT

Research Questions

What are the barriers to decision making about surplus eggs? What factors would enable the donation of surplus eggs to others or to research?

Design

An exploratory pilot mixed-methods study comprising a) an online survey of 50 people who had frozen their eggs and b) semi-structured follow up interviews with 16 people. Data were collected from seven IVF clinics, from one fertility group primarily located in Victoria, Australia. We investigated the factors that influence decision making about surplus eggs, and the barriers to and enablers of egg donation.

Results

Decision making about the fate of surplus eggs is often complex and sometimes based on inadequate or inaccurate information. Participants suggested that decision-making could be facilitated by providing timely support, targeted information and ongoing communication. Participants suggested that insights into the experiences of egg donation from donors, donor-conceived children and intended recipients, would be helpful in deciding whether to donate their surplus eggs to others. Factors that could encourage donation to research include information about research goals, outcomes, and medical impacts.

Conclusion

We propose several strategies that could be readily implemented to make it easier for people to come to a decision about surplus eggs rather than discarding them, leaving eggs in storage indefinitely or avoiding these decisions and abandoning eggs. More timely information about the options for surplus eggs and about the lived experience of people who have made similar decisions, as well as those who have received donor eggs and their families, would be welcomed by patients with frozen eggs.

Keywords

Egg freezing, egg donation, surplus eggs, egg disposition, egg storage, unclaimed eggs

INTRODUCTION

In recent years, there has been a dramatic uptake of egg freezing as an option to address the risk of future infertility (Johnston et al., 2021; Newman et al., 2023; HFEA, 2023). However, despite the surge in egg freezing, only a small proportion of individuals have returned to use their frozen eggs in assisted reproduction (Gurtin et al., 2019; Xu et al., 2022; Walker et al., 2022; Johnston et al., 2024). As a consequence, surplus frozen eggs are rapidly accumulating in storage facilities. Legislation and guidelines in some countries determine the time that eggs can remain in storage. In Australia, storage limits vary between states and territories. In the state of Victoria, under normal circumstances eggs can remain in cryostorage for up to 10 years, unless requests to extend storage limits are approved by the statutory authorities or if other conditions are met by the person as per the Victorian Assisted Reproductive Treatment Act 2008 (Stuhmcke and Chandler, 2014). If people who have previously frozen their eggs stop paying storage fees and/or do not respond to repeated attempts at contact from service providers, eggs must be discarded as required by statutory law once storage limits have been reached.

A significant proportion of frozen eggs remain unused or unclaimed in storage facilities worldwide (Pennings, 2023; Reich et al., 2022; Johnston et al., 2024). Estimates suggest that there are more than three million eggs currently stored that will never be

utilised (Bahadur, 2021). Managing and maintaining a large inventory of frozen eggs presents challenges, including space limitations and regulatory compliance.

The prolonged storage of surplus frozen eggs raises ethical questions about the fair use of limited resources. There is a global demand for donor eggs. In some countries egg donation is prohibited or unavailable, while in other countries there are few egg donors or there is a lack of donors to 'match' would-be recipients (Caughey et al., 2021; Whitaker et al., 2019; Tsai et al., 2024). In the face of an increasing demand for eggs to help others conceive and also for research (Johnston et al., 2024; Mills et al., 2022), the accumulation of unclaimed and unused frozen eggs has been described as wasteful and ethically problematic (Friedrich, 2020; Reich et al., 2022; Pennings, 2023; Johnston et al., 2024).

In Australia, the supply of donated eggs does not meet demand, payment for the supply of human eggs is prohibited and waiting times for altruistic egg donors can be many years (Hammarberg et al., 2011; Caughey et al., 2021). Because of the critical shortage of donor eggs in Australia, some clinics are now importing donor eggs from abroad. This practice is permitted, but supply is low as the provider must comply with Australian national and state laws, specifically the requirement for non-anonymous and non-commercial egg donation and export of eggs to Australia (VARTA 2023).

Several scholars have addressed the possibility that surplus eggs could be used for secondary purposes such as egg donation to assist other infertile people (Mertes et al., 2012; Borovecki et al., 2018) or that unclaimed eggs should be used for biomedical research (Mills et al., 2022). Mechanisms such as egg sharing (Rimington et al., 2003), co-opting to research (Friedrich, 2020) and financial reimbursement for donation (Polyakov and Rozen, 2021; Pennings, 2023) have been considered as possible solutions to the increasing demand for eggs. Some have postulated a moral duty to donate surplus eggs where they are in short supply (Mills et al., 2022; Fuscaldo et al., 2023). However, proposals for redirecting surplus eggs have also been associated with concerns about the possible exploitation and commodification of egg providers (Pennings, 2023; Friedrich, 2020; Haines et al., 2012).

Research exploring the views of people with eggs in storage suggests that redirecting eggs is not as simple as proposed. Egg disposition has been described as difficult and associated with emotional distress, guilt, uncertainty, and grief (Caughey et al., 2023; Johnston et al., *forthcoming*). Some people avoid the decision for as long as possible (Caughey et al., 2023). The option to donate eggs to another person has been associated

with complicated emotions; many consider it a good or admirable thing to do but struggle with the concept of having a genetically related child that they do not know or are not involved in raising.

Further, there appears to be a discrepancy in people's intentions and what they ultimately decide about the fate of surplus eggs. While limited, previous research exploring people's egg disposition decisions has reported that, at the time of egg collection, many people with frozen eggs indicate an intention to donate eggs that they no longer require (Caughey et al., 2021). However, most people who have relinquished their surplus eggs have elected to discard them, and very few have ultimately donated their surplus eggs (Blakemore et al., 2021; Caughey et al., 2023; Johnston et al., 2024). Exploring the difficulties that people face in making decisions about the fate of their surplus eggs and factors that cause people to change their mind might reveal possibilities for facilitating decision-making, which could in turn support egg disposal and donation.

In this study we explore the factors that underpin decision-making about surplus eggs and how decision-making can be facilitated. We reason that identifying the factors that make it difficult for people to make decisions about the disposition of their surplus eggs will elucidate strategies to enable egg donation and will address some of the ethical, emotional and logistical challenges associated with the accumulation of stored eggs. Our study represents one of few in-depth investigations of patients' attitudes to the available and possible options for surplus eggs and, to our knowledge, is the only study reporting the views of people who have frozen eggs about the factors that could be implemented to support decision-making.

METHODS

A pilot mixed-methods study comprising a) an online survey of people who had frozen their eggs and b) semi-structured interviews with a subset of people who completed the survey and agreed to a follow-up interview. People who had eggs frozen for fertility preservation (medical or non-medical/social) or as part of a treatment cycle (e.g. if no sperm was available on the day of egg pick up) were eligible to participate. Those who had returned to use all their frozen eggs in treatment were excluded from the study. No other exclusion criteria were applied.

This paper presents part of the findings from a research project exploring people's experience of egg freezing, reported in two parts. Part One of the study, reported elsewhere (Johnston et al., *forthcoming*), is focused on people's experience of and reasons for freezing eggs, their intentions and actual decisions about surplus eggs and the factors that underpin their decisions. This paper reports on Part Two of the study, which investigated factors that might facilitate decision-making about the fate of frozen eggs that are surplus to need.

Survey methods:

An anonymous survey was hosted on Qualtrics, an online survey platform comprising close-ended and open-ended free text options, between February and July 2023. People who had undertaken egg freezing with one Australian fertility group across seven regional and metropolitan Victorian clinics were invited via an email from the clinic to complete the anonymous online survey. Advertisements were also shared on social media.

The survey comprised approximately 100 questions (an exact figure cannot be given due to branching question logic) about people's experience of egg freezing, and their decision-making regarding surplus eggs, including what factors influenced their decisions and whether and what support they would want to make decisions about surplus eggs. The survey questions were developed by the research team informed by our previous research on egg freezing (Johnston et al., 2024) and embryo donation (Fuscaldo et al., 2007), and were piloted among colleagues.

This paper reports on a subset of the survey questions to better understand the barriers and enablers of decision-making about surplus frozen eggs, including the fate of unclaimed eggs, and summarises responses to nine survey questions (Table 1).

Interviews:

At the end of the survey, participants were asked to indicate whether they would be willing to take part in an individual follow-up interview. The purpose of the interview was to explore more fully people's experience of and motivation for egg freezing and their intentions and decisions about frozen eggs surplus to their needs.

Individuals were offered the option of face-to-face, online or telephone interviews. With participants' consent, all interviews were audio-recorded and transcribed. Interviews ranged from 30 minutes to 90 minutes and were conducted between March and July 2023.

The interview schedule comprised 16 open-ended questions. This paper reports on the subset of the interview questions, focusing on responses to eight interview questions that explore people's views and ideas about factors that might facilitate decision-making about surplus frozen eggs (Table 2).

Ethics

This study was approved by the Monash Human Research Ethics Committee (#35995). Participants' privacy has been protected by removing names and other identifying information.

Data analysis

Quantitative data from the close-ended survey questions were summarised using percentages and frequencies using IBM SPSS Statistics, version 28 (IBM Corp, 2021).

Data from each of the interviews, together with the qualitative data from the open-ended survey questions, was analysed in NVivo, a software designed for qualitative analysis. The analysis was conducted using Inductive Content analysis (ICA, as described by Vears and Gillam, 2022), which involves an inductive approach where codes are developed based on the actual content of the data set. Through iterative coding, the researchers identified and labelled sections of text, grouping them into content categories and subcategories that emerge from the data. These content categories represent broad ideas or concepts within the data set.

RESULTS

Demographics:

A total of 324 people who had undergone egg freezing were invited to participate in the survey and 50 people completed all or most survey questions. A total of 16 people participated in interviews; 13 individuals participated in an individual online interview, two had telephone interviews and one provided written responses to the questions. All participants in the sample had undergone egg freezing in the period of 2005-2021.

Among the survey respondents, 13 participants indicated that they had finalised the disposition of their surplus eggs and no longer had eggs in storage; of these, two reported that they donated to research, and 11 participants had discarded their surplus eggs at the time of survey. The remaining 37 participants still had eggs in storage. Of those who were interviewed, 12 still had frozen eggs in storage at the time of the interviews, and of the remaining four, one person reported donating surplus eggs to research and three had discarded their surplus frozen eggs.

Most participants (48/50) identified as women and the majority of participants (32/50) were 41-45 years of age; 25/50 participants had postgraduate qualifications, all but four were born in Australia, 22/47 did not currently have children, 17/50 hoped to have a/another child, and 22/50 indicated did not want to have a/another child.

In what follows, we present participants' responses on whether and what support would assist the decision-making process about surplus eggs, including what specific supports are needed for each option available (dispose or donate).

Support for decision-making about surplus eggs

Just under half (22/48; 46%) of the participants were satisfied with the support and information that was, or is, currently available to support them to make decisions, and indicated that they did not or would not want more support. However, others were either unsure (12/48; 25%) or indicated that they would have benefited from more support (14/48; 29%). Fewer people who had already relinquished their surplus eggs (3/12; 25%) indicated that they would have liked more support for decision-making than those who still had eggs in storage (11/36; 31%).

Similarly, among the people interviewed, two stated that they felt clear about the options for their surplus eggs, and they did not feel that they needed further support. They commented that counselling and information sessions were already in place and that they were satisfied with the opportunities to ask questions or for more information. One participant suggested that sometimes too much information can be confusing.

Sometimes a bit too much information can actually make it a little bit more confusing for the woman, so maybe I think it's something to consider as an optional.

But don't think that I missed out on anything not being available. (Interview Participant 9)

However, others commented that more support would be welcome. A few participants suggested that there was good support for people to consider and take up egg freezing, but that little support is available after eggs are frozen and in storage.

I think extra information, such as support, would be good. I found that the process was great at the start, you had your counselling sessions and you go through the process, it's all very clear, but, once your eggs are in storage, when you're in that in between, you don't get any communication or anything, you just get your invoice sent out. I think that part gets missed because people have to figure it out for themselves, well, what do I do? Am I able to donate these to somebody else, or to research? There's not really a check-in process, or something like that, every two years, or two, three years, to go, how you feeling about your eggs in storage? Would you like some further counselling? (Interview Participant 7)

Participants who indicated they would like more support were asked to indicate from a list of options, the type of support that could be assist them to make decisions about the fate of surplus eggs. The most popular choices were: a counselling session on making decisions about surplus eggs, more information about research programs that would utilize eggs, and more information about the experience of being an egg donor and those of children born as a result of egg donation (Figure 1). Participants elaborated on these suggestions in the survey free text and interviews, as described below.

More Information about options and common issues

One survey respondent noted in free text that they would have liked some more communication about options for surplus eggs.

Some form of communication. All of these [disposition] options ... suggest that [the provider] has come a long way since I first donated eggs. These options never existed. I was never consulted. I only ever received bills for storage. (Survey participant)

Similarly, an interview participant suggested that more information about each option or how to find out more about each option would be helpful.

It could be as simple as a Google form [with options for] continue freezing eggs, donate to a person, research, discard. More information is available on any of these options, by contacting blah blah. Always having somebody available to discuss what these options mean would be immensely helpful. (Interview Participant 8)

Some participants suggested that more information about the kinds of decisions that people with eggs in storage will face is warranted. Another interviewee suggested that counsellors could help to inform written information about options and common issues which might assist people in making decisions about surplus eggs.

That's maybe something that you could investigate, as to whether like – instead of people accessing [a counsellor] for support, if you questioned the counsellors on what are the common issues for people who are challenged by what do they do with the remaining eggs and embryos, maybe they could deliver a booklet or something. If you're thinking this, la, la, la, if you're thinking that... (Interview Participant 2)

Experiences of others

Interview participants elaborated on factors that might assist with decision-making, and reiterated that the opportunity to hear from or speak with people that had been through egg freezing, and hearing about how they came to a decision, would be helpful.

Maybe hearing some other experiences would help, even if that's videos of people who've done that or what the process is or something. (Interview Participant 4)

He sat down with me, we went through all the options about what to do with the eggs...It was helpful to have someone who'd actually been through it, been through it himself. (Interview Participant 10)

More specifically, interviewees suggested that they would benefit from talking with people like themselves who had been through egg freezing, as illustrated by the comments of two young people who froze eggs.

[I was] just feeling like it wasn't an individual experience... even now, I have never met anyone that's had them frozen young. I haven't met anyone even remotely similar. So, I think even just speaking to one person would've made a difference in... Obviously, I spoke to a couple of my friends ...but there's only so much talking you can do when people, actually, just don't have any understanding. (Interview Participant 3)

Perhaps it might've been nice to be able to talk to someone in my position, someone else, another trans guy who'd done it... but I didn't have anything like that. (Interview Participant 12)

Communication

Several interviewees suggested there was little communication after eggs were placed in storage and that more frequent communication would be welcome, including updates which might facilitate decision making.

I think I reached out and contacted them, because I'm getting these invoices, and that was the only correspondence. So maybe something else that comes with that once a year or just a couple years or something. (Interview Participant 4)

No I didn't have enough information because all I had was a bill, nothing else with it. No information about what is going on, like here are your options. I think that instead of just getting invoices, there should be something to trigger thinking, to get some information about what the options are now. (Interview Participant 15)

One interviewee reflecting on past experience commented that communication could have been clearer and that by the time they had to make a decision about their surplus eggs, they were told the eggs could not be used.

I wish there had been better communication at the time. But we're talking, maybe 10 years ago. He [lab technician] said, we don't have the method to unfreeze them so their quality will not be any good. I'm like, oh why have I been holding on to them? Why have I been paying all of this money for all of these years, why wasn't I told that? They were only interested in eggs from, whatever date on. I'm like, so I've been paying six monthly fees for all these years when there was no hope of them ever being any use to anyone? (Interview Participant 8)

Discarding surplus eggs

In relation to the option of discarding surplus eggs, when asked to choose from a list of factors that might facilitate the decision to discard surplus eggs (Table 3) most respondents indicated that they did not require further information. However, an equal number (14/46; 30.4%) indicated that knowing how eggs were discarded would be helpful. Some respondents indicated that they would like to be able to choose how eggs are discarded or take them home to dispose of eggs themselves. Eight participants who had already disposed of their surplus eggs indicated that they required no further information on this option.

Several Interviewees described discarding eggs as a waste. Some referred to the cost and effort associated with egg freezing and the shortage of donor eggs for reproduction, as the reason they believed it to be wasteful to discard eggs.

Last resort

Many participants indicated a reluctance to discard eggs and described this as the option of last resort.

It's not something I'd want to do because it would feel like such a waste because it's such a complex and expensive procedure to get them in the first place. As a result,

and because of the way that Australian legislation around IVF is structured, there is that shortage of eggs.

So, not something I'd consider unless by some miracle overnight the whole shortage of egg situation was solved, and they were just no longer in demand for whatever reason. (Interview Participant 11)

Others indicated that they would rather not discard eggs if their eggs could be used for research to help others.

Well, I didn't want to discard them, because it felt like a waste, and I'm not sure how I'd feel about someone else having them, so obviously, if it [donating to research] helps other people, then yeah, [I'd prefer to donate to] research. (Interview Participant 6)

Donation to research

When participants were asked to reflect on factors that might make them consider donating surplus eggs to research, most survey respondents selected the following: knowing the purpose of the research, knowing how eggs might be used in research, and finding out about the research outcomes (Table 4). Just under half (46%; 24/48) of survey respondents with eggs still in storage indicated that being paid/compensated to donate to research (e.g. reimbursed for storage fees, egg collection fees) would make them consider donating eggs to research. Only 3 respondents indicated that they did not need any more information about the option of donating surplus eggs to research.

Participants elaborated on things that could help make the decision to donate eggs to research easier, as summarised below.

Regular updates on research

One survey respondent suggested, in free text, that rather than patients having to search for this information it should be provided in a regular update.

When those invoices come every month it would be beneficial to get an update on what

is going on, like what research projects [the clinic] is involved in and where eggs could be donated. I'm always having to ask, are there any research projects on at the moment? Rather, there should be a pamphlet or email telling us that there is a new research project going on (Survey participant)

Information about research uses and outcomes

Similarly, interviewees commented that having information about how their donation could benefit research, whether donated eggs were used to train scientists or in research to advance medical developments, and the outcomes of research projects would be welcome. As one participant commented, people who donate to research may not know if and how their eggs are used.

I was happy with that decision at the time [to donate to research]. I probably felt good in that they weren't going to waste ... it's a good feeling knowing that they may be of benefit but I suppose in the back of my mind is oh well, if they're not useful to the research, they'll probably just get thrown out anyway. You don't really know what's going to happen so there's that element or feeling of who knows exactly what they're using them for.... (Interview Participant 5)

One participant made an analogy with organ donation to suggest that people who donate eggs to research could be told about the research and would feel good knowing that their donation benefited others.

I think it would be interesting to know what kind of research and what is expected to find. Like is it some kind of research on techniques or is it for training? I think it would be interesting to know is this, for example like organ donors. Sometimes they get an idea of where they've gone. I think it would be interesting to know ...what it's helping, what it's benefiting. That doesn't need to be anything extravagant. That could be an email that says, your egg has gone to training at [the Clinic]. You'd be like, wow, that's amazing. I'm glad that it's benefited in that way. (Interview Participant 13)

One participant commented that the lack of information about the demand for eggs for

research, how eggs are used, or the possible benefits of contributing to research, is a barrier to donation to research. This participant suggested that the demand for donor eggs for reproduction was well known to them but not whether there was a demand for eggs for research.

I guess the reason why it's [donation to research] not as appealing to me is because I don't know as much about what specific research it would be used for, what the benefits of that research are, what the – are there supply shortages in research or do they have other sources that aren't available for donors in Australia. I just don't know as much about it because I guess the donor story is quite well told. (Interview Participant 11)

Timing of information

Interview participants reiterated that it would be beneficial to receive information about research or counselling about options at different time points. Receiving information and updates closer to the time that decisions need to be made about the disposition of surplus eggs would be helpful and would be more relevant some years later, rather than at the commencement of egg freezing cycles when thinking about surplus eggs is not front of mind.

if when it's coming up to the 10-year mark ...something like an information brochure, that would be good. Because you get invoices from them every six months, so maybe just on the ninth year something comes out with more information (Interview Participant 6)

...more the information at different stages maybe. At the end [of the storage period], towards the end or maybe when your five years are coming up [clinics could ask] have you thought about these options? (Interview Participant 4)

Freeze on fees

A few interviewees suggested that there could be a freeze on storage fees for people who would like to donate to research but are unable to because there is no demand for eggs for research at the time that they need to make disposition decisions.

If you could hang on to them until there was a research project available...Yes that is what I'm doing –But the payment should be frozen while I wait to be able to donate to research (Interview Participant 15)

Donation to others

Participants selected from several factors that could help with the decision to donate surplus eggs to other people for reproduction (Table 5). The most popular choice, selected by just over one third of the survey respondents (37%; 18/48) was the possibility of knowing something about potential egg recipients. 29% (14/48) of respondents indicated that nothing would make them consider donating surplus eggs to others.

Participants elaborated on the option to donate their eggs, including what influences this choice and what could assist their decision-making. The main categories are described below.

Ties to genetic offspring

Several participants commented, in free text and interviews, that they could not donate an egg to another person because of their feelings about genetic relationships and the separation of genetic and social parenthood. These attitudes are discussed further in part 1 of this study, reported elsewhere (Johnston et al., *forthcoming*).

Information about recipients

Among the factors that might facilitate donation to others, interviewees suggested that having more information about potential recipients would help. They also suggested that the opportunity to talk to others who have made the decision to donate to others would be helpful.

...maybe, just education and trying to inject a little bit of that personal side of it. I think people are very sensitive to other people's feelings. So, I think maybe, in some instances, that would change people's minds or that would make it easier for people in knowing who it [donation to others] was helping or how it was helping or why it was helping. (Interview Participant 3)

I'm happy to donate to someone I don't know. I think just knowing a little bit about the recipients would be good in terms of their family background, all of that sort of stuff. (Interview Participant 7)

Reassurance about child's welfare

Participants commented that the option to donate eggs to others is impacted by concerns about whether a child born as a result of their donation would be well cared for.

I think for me I would be happy to do it but the selfishness aspect is I still think I would want to have some kind of connection even though I wouldn't necessarily be the child's parent or mother. I would still feel some sense of responsibility or some sense of curiosity even to wanting to know that that child is loved, cared for and all those things that you hope for any child... Yeah, whereas [if I donated to] someone like my sister-in-law and her partner, I know them, I know the broader family network, I know that [the child] would be nurtured and well loved and cared for, you know, that sense of I know that child would be okay is something that would also allow me to give them the opportunity to be parents. (Interview Participant 5)

More time

One interviewee commented that they felt pressure to make a decision about surplus eggs quickly, to avoid ongoing storage fees, and that with more time they may have changed their mind about donating their surplus eggs. This participant also pointed out that the process of donating involves counselling and testing and takes time.

I think it [decision making] was more like, we want to stop paying for this now. What's the quickest way to stop paying? ...whether that's an incentive or a freeze on the paying for storage, would help. I think it would have made a difference of the timing. I probably would have left it for longer and maybe now thought about it and changed my mind. Or I would have done it [donate eggs], waited till I had enough time and space in my life to go through that process. Go through the counselling and think about it and all that stuff...I think I did feel a bit of time pressure with the cost,

ongoing costs and to make a decision. Whereas if that was taken away, maybe you'd wait till you're in a different mindset or you've got the time. Because that takes a lot of time to do all that stuff and think about it. (Interview Participant 4)

Views change with insights

Some comments suggest that people's views about donation to others changed over time with the understanding of what other infertile couples might be going through, and with more time for reflection.

My position has certainly changed particularly in the last few years. My sister-in-law and her partner have recently gone through fertility treatment ... it raised those memories...of discarding my eggs for research. But what if I still had those eggs, potentially that could have been used for someone I care about in order for them to have a baby. I think it's that personal connection, them going through something that we'd gone through a decade plus earlier... if I still had those eggs and she needed them, I would do anything for her and her partner to be able to have a baby. (Interview Participant 5)

So at the time I just couldn't picture how that would work or I was worried that someone in 18 or 20 years' time would find me. What would happen if something bad had happened to that child, or they didn't have a good life, or they didn't have good parents or that kind of thing. I was worried about that....But now, a few years later, I reckon I've changed my mind now, maybe we should have thought about it a bit more. We really didn't - my partner and I talked about it a little bit, but we really didn't look into it in much detail. Now I think I probably think a bit differently. Maybe that would be okay, or maybe it wouldn't matter, or maybe that could be a good thing in 25 years if someone could reach out and find us...we just probably didn't give it a lot of thought at the time. (Interview Participant 4)

Knowledge of options/process

Several of the interviewees' comments suggest a lack of clarity about the processes involved for the donation of surplus eggs. Some comments indicate that some people do not have

accurate knowledge about donation, what processes are involved or where to get this information.

I think knowing more about the long-term process, like can they find out who you are, and all that sort of stuff – because I don't know what the process is long-term, so, yeah, I guess more information, again, from other people. (Interview Participant 6)

Awareness of demand for donor eggs

Most (20/48; 42%) respondents indicated that they did not know about the demand for donor eggs, 17/48 (38%) responded they did know, and 11 (23%) were unsure. Just over one third (38%; 12/31) of respondents indicated that becoming aware that there is a demand for donor eggs did change how they felt about donating eggs. Survey participants elaborated how this information had changed their views, as illustrated in the following quotes.

I was unaware you could actually donate eggs to people you don't know within Australia (survey participant)

I could have made the eggs available earlier (survey participant)

Feel more guilty - I may not have [donated] but I would've liked to be better informed (survey participant)

Similarly, some interviewees who had not, or who did not already intend to donate eggs to others and were not aware of the demand for donor eggs commented that having information about the demand might change their minds or at least cause them to think more about this option.

No, it [a waiting list for donor eggs] never crossed my path. If I was aware of it, it would have prompted me to take action, earlier and more decisively. Once I got my baby, that's it. The only communication from [the clinic] I had was, the invoice I got. That was it. (Interview Participant 8)

Yeah. I think it [knowing there was a high demand for donor eggs] would have made a difference, or at least made me stop to think about it a bit more ...It's only in hindsight now that I think about, maybe I should have done something differently with them... I don't know if we would have made a different decision. I still have some reservations about that, but I probably in hindsight think I should have thought about it a bit more, found out a bit more information about it. (Interview Participant 4)

Unclaimed eggs

Survey participants were asked for their views about what should be done with unclaimed eggs. A small majority (36%; 17/47) indicated that unclaimed eggs should be used for research, 13 (28%) indicated that they should be discarded, nine (19%) thought that they should remain in storage, and one person indicated that they should be given to others for reproduction. Seven participants provided further comments, stating that sufficient efforts should be made to contact the individuals before action is taken with their frozen eggs and that ample time to respond should be ensured. One participant suggested that an opt-out system for donation to research would be appropriate.

DISCUSSION

The accumulation of frozen eggs around the world presents both significant burdens and a possible solution to the global demand for donor eggs (Mertes et al., 2012; Borovecki et al., 2018, Friedrich, 2020; Caughey et al., 2021; Mills et al., 2021). This study sought to elucidate factors that might facilitate decision-making about surplus eggs and shift the current trend, which sees most frozen eggs unused and ultimately unclaimed and/or discarded (Friedrich, 2020; Caughey et al., 2021; Johnston et al., 2024). We identified three broad categories of factors that can act as both enablers and barriers to decision-making about surplus eggs: information, communication and shared insights.

Accurate and timely information is obviously important in assisting people to make informed choices. However, our findings concur with previous work reporting that there is a lack of information, or even misinformation, about the options and processes for the

disposition of surplus eggs (Baldwin and Culley, 2018; Harwood, 2015; Hammarberg et al., 2017; Jackson, 2018; Mayes et al., 2018; Caughey et al., 2023). For example, some people did not know that donation to research was possible, some were not aware that they could donate eggs to non-relatives or that in Australia, egg donors cannot be anonymous and all donors have the option of finding out whether egg donation has resulted in the birth of a child. While research shows that people would prefer to donate surplus eggs to avoid discarding them and to 'give something back' (Caughey et al., 2021), our research adds to previous findings that many people are not clear about what donation entails (Baldwin, 2019). Fertility clinics provide various sources of information about the options for egg disposition, and some hold counselling and information sessions about egg freezing. However, our study demonstrates the need for more specific information about the options for surplus eggs and the processes involved to support patients in making informed decisions.

Further, our findings suggest that people may not remember or access the available information, or that information about the options for surplus eggs may be provided at times where it is not relevant to the current stage of their reproductive journey. Our findings suggest that ongoing communication, rather than one-off information packs or sessions, might assist people to make decisions by providing more relevant, specific and timely information about their options and the processes involved. Some of our participants reported that the only communication that they received after freezing their eggs was regular invoices for storage fees; this could also be an opportune time to provide information about the demand for surplus eggs and current options for donation. As previous research suggests (Caughey et al., 2023), people with surplus eggs would benefit from more regular 'check-ins' about their preferences and more regular input about the current state of research options and demand for egg donation to others. Further, ongoing communication would help to ensure that the fate of surplus eggs does not simply default to discarding eggs because they were not fully aware of other current options.

Our findings echo previous reports that people view discarding surplus eggs as a waste and is a last resort (Mertes et al, 2012; Friedrich, 2020). In Australia, when statutory storage limits have been reached, clinics are required to discard eggs, unless the patient advises otherwise. Our findings indicate a lack of consensus about the fate of unclaimed eggs: just over a third (36%) of respondents indicated that unclaimed eggs should be

directed to research, while 28% thought these eggs should be discarded. The disparity in attitudes we report suggests that the default option of discarding eggs is not universally accepted as the best option. It also raises a question about the appropriateness of or the rationale underpinning different consent thresholds for discarding eggs (opt-out) and donating eggs (specific consent at the time of relinquish).

Currently in Australia, specific consent is required for the donation of gametes to research and prospective donors must receive specific information about the research projects seeking eggs before they can consent to egg donation (National Health and Medical Research Council, 2017). In practice this means that the opportunity to donate to research is limited by the availability of active research projects, and that prospective donors cannot consent to egg donation for future, unspecified research. The limited opportunities for donation created by this model, have prompted several scholars to suggest that consent procedures for egg disposition need to be reconsidered. For instance, the introduction of a 'dynamic consent' platform could be effective in allowing valid consent to be maintained and updated across the lifetime of storage (Mills et al., 2024). This would be consistent with the view that "consent must be re-envisioned from a singular event to a multiple process" (Chandler et al., 2014). Dynamic consent platforms would possibly also enhance information flow about research donation opportunities for people with surplus eggs as they become available. Supplemented with the adoption of 'broad consent', wherein people with surplus eggs could consent to types of research, rather than specific projects, such systems would significantly enhance opportunities for research donation. Further, revising the default position for the disposition of unclaimed eggs from discard to donation to research would help to stem the wastage of unclaimed eggs. This would mean that when storage limits are reached, and the person can no longer be contacted by the clinic, rather than the clinic being required to discard such unclaimed eggs, they could be used by researchers instead (Mills et al 2022). To optimise research involving human gametes and create more opportunities for those wanting to donate surplus gametes to do so, the feasibility and public acceptance of these suggestions should be investigated.

One novel suggestion we report is the possibility of suspending storage fees for people who would donate surplus eggs if appropriate research projects were available, or became available in the future. As we report elsewhere, storage fees influence people's disposition decisions (Johnston et al., *forthcoming*). People who want to but cannot donate

to research because that option is not available have reported discarding their eggs in part to avoid further storage fees (Johnston et al., *forthcoming*). Further, in the current study, one participant explained that while they no longer require their eggs, they were continuing to store them to wait for a research project they could donate to. Given that acquiring eggs for research is resource intensive, being able to draw from a pool of surplus eggs may help facilitate research pursuits. While suspending fees may relieve some of the pressure on decision-making for patients, the feasibility of this possibility needs further exploration.

Our findings concur with previous research showing that people's intentions and decisions about the fate of their surplus eggs can change over time and with new insights. As Caughey and others have suggested, disposition is a process not an event (Pennings, 2023; Caughey et al., 2023). Interestingly people tend to attribute diametrically opposed meanings to their eggs; some describing eggs as part of them or future children and others refer to eggs as 'just cells' (Kirkman, 2003; de Lacey, 2005; Caughey et al., 2023). However, our findings suggest that the meanings that people attach to their eggs do not entail that their decisions for surplus eggs are 'set in stone'. Our participants indicated several factors that might change their minds, and also described life circumstances (e.g. familial experience of infertility) that made them feel differently, in particular about the option of donating to other people. For example, most of our participants did not know about the demand and long waiting lists for donor eggs, and some people indicated that this information might have caused them to think more about this option and may have changed their views about donating eggs to others. Our findings show that new insights and information can cause people to reflect on their views and their preferences for their surplus eggs.

While it has been postulated that people might be more likely to donate surplus eggs than surplus embryos (Mertes et al., 2012; Reich et al., 2022), participants' responses about the disposition of surplus eggs in this study are similar to those previously reported for people making decisions about surplus embryos (Hammarberg and Tinney, 2006; de Lacey, 2005; Fuscaldo et al., 2007; Goedeke and Daniels, 2014). As with decisions about surplus embryos (Fuscaldo et al., 2007), one of the most troubling features of donating eggs to others appears to be the possible existence of a genetically related child and/or siblings, and the view that genetic parenthood entails ongoing responsibilities for genetic children (Johnston et al., *forthcoming*). However, participants also identified factors that could

ameliorate these concerns. For example, knowing more about intending parents and having more assurances about the future care of children born through egg donation might facilitate donation to others. Hearing from people that have used donor eggs about the wellbeing of their families and children, and how they navigate donor conception with genetic progenitors, might also address the feelings of guilt associated with relinquishing eggs and not donating to others. Providing more opportunities for reflection by allowing people with surplus eggs to hear about the experiences of egg donors might assist with addressing fears or concerns around donation. Further research could focus on addressing the moral distress associated with the separation of genetic and social parenting, and whether it can be ameliorated by providing opportunities for learning and sharing the experiences and insights of egg donors, recipients and donor-conceived children.

It is necessary to acknowledge that reproductive gamete donation is governed by strict eligibility criteria in Australia, meaning not all who want to donate will be able. For example, in a recent study that analysed 3082 egg freezing cycles, more than half of the cohort were aged ≥ 36 years at the time of freezing and would be ineligible to donate eggs on the basis of age (Johnston et al 2024). Previous medical history and genetic carrier status may also discount many other prospective donors. The eligibility criteria imposed are at the discretion of each individual fertility clinic which has led to inconsistency in the provision of donor conception within the sector (Hunt and Swift, 2024). So while efforts are needed to address fears, concerns or uncertainties about gamete donation, at the same time, policies governing donor conception should be reviewed to ensure they are evidence-based, just and optimise the availability of a limited resource.

The strength of this study is that it is the first to investigate the factors that might assist patients facing egg disposition, including what specific supports are required for people considering egg donation. The data we report provides insights and suggestions that could be easily actioned by providers to facilitate decision-making and address the ongoing build-up of surplus eggs. However, we acknowledge that this research was carried out in Victoria, Australia which has particular legislative requirements, that may affect the management and disposition of surplus eggs and limit the application of our findings. Further we note that while the option to donate to research is theoretically available, research programs accepting eggs were not always available during the periods reported (Johnston et al 2024). As a pilot study, our sample size was small and therefore comparative

analysis between demographic groups was not possible. Future studies with larger samples are warranted to confirm our findings and to further explore the support needs for different groups of people.

Decisions about the fate of surplus eggs can be complicated and are sometimes based on inadequate or inaccurate information. We report several factors that make decision-making about surplus eggs difficult and identify factors that could be actioned to enable the donation of surplus eggs to research and to people with infertility. These include more detailed and targeted information about options, more regular communication over the duration of egg storage and introducing opportunities for people with surplus eggs to learn about the experiences and insights of those who have relinquished eggs from storage and of donor-conceived families. Together these suggestions may promote autonomous decision-making about surplus eggs by helping people to consider and reflect on their intuitions and concerns about egg disposition, and the meanings they attach to genetic parenthood. In addition, further discussions with people who have frozen their eggs about the fate of unclaimed eggs and how consent and disposition choices should be managed over the duration of egg storage are warranted given the finding that disposition decisions change with new insights and circumstances (e.g. familial experience of infertility).

The aim of 'not putting all of one's eggs in one basket' by freezing eggs to mitigate against future infertility has created a surplus of unused eggs. At the same time, the demand for donor eggs for research and for reproductive purposes continues to increase. Supporting people to make more informed and authentic decisions about their surplus eggs may help to move eggs out of the basket.

Authors' roles

M.J and G.F drafted the questionnaire and interview guide, with contributions from C.M. M.J and G.F oversaw data collection and conducted data analysis and interpretation. G.F. drafted the manuscript, with input from M.J. All authors have read, edited and approved the final manuscript.

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Conflict of interest

MJ has received research funding from Monash IVF and Ferring Pharmaceuticals. She reports honorarium and travel support from Gideon Richter. DZF is a minority shareholder of Monash IVF Group and reports honorarium from Organon. CM reports research funding from Monash IVF and Ferring Pharmaceuticals, travel support from Monash IVF and is an executive member of the mitoHOPE program.

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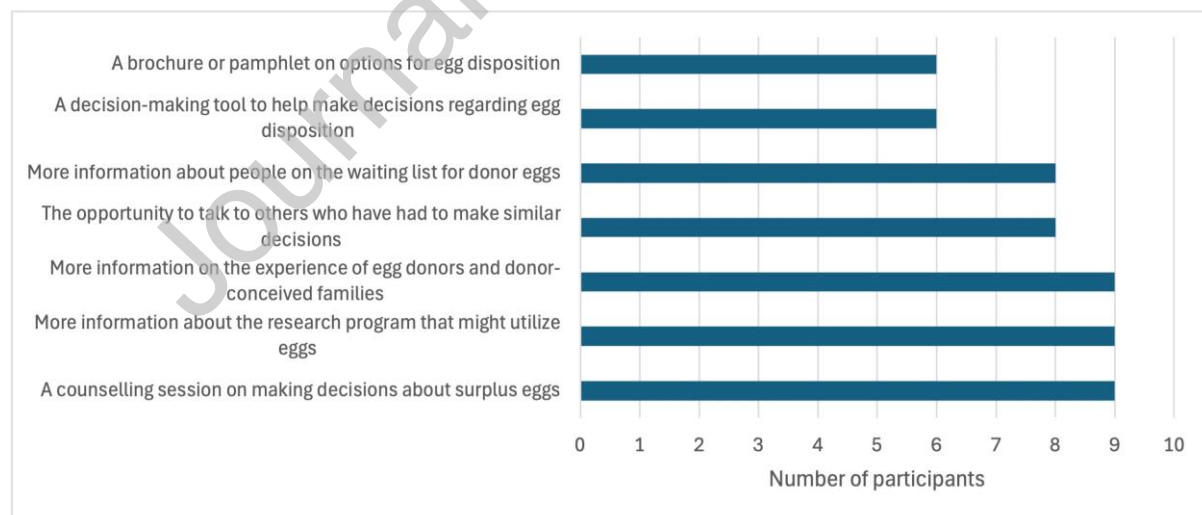
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Legend to Figure

Figure 1: Additional supports welcomed, as indicated by participants who needed more support when determining the fate of their surplus eggs (n=14).

Table 1: Survey questions reported in this paper

| |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| What did you decide to do/ do you intend to do with your surplus frozen eggs? |
| Would you like/would you have wanted more support in deciding what to do with your frozen eggs? |
| What extra support would you like/have liked? |
| What factors would help you to donate your surplus eggs to an infertile person or a person who needs a donor egg because their eggs are not suitable for use? |
| What factors would help you to donate your surplus eggs to research? |
| What factors would help you to discard surplus eggs? |
| Do you/did you know if there was a waitlist for patients who require donor eggs for reproduction? |
| Does knowing that there is a waitlist change how you feel about donating your eggs? |
| Regarding eggs in storage, where patients have not responded to attempts from the IVF clinic to contact them, and are no longer paying storage fees; what do you think should happen to these eggs at the end of the storage limit? |

Table 2: Interview questions reported in this paper

| |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [for participants with surplus eggs still in storage and who have not yet made a decision about the fate of their eggs] |
| 1. How do you feel about the need to make a decision in the future about the fate of frozen eggs that you no longer want to use? |
| 2. What kinds of things would help you to make this decision? |
| [for participants who have made disposition decisions about their surplus eggs] |
| 3. Can you describe how you made the decision about the fate of your surplus frozen eggs? a. What kinds of things helped you to make this decision? |
| 4. Did you receive support in deciding what to do with your surplus frozen eggs? a. Would you have liked more support when deciding what to do with your surplus frozen eggs? |
| 5. What did you decide to do with the frozen eggs you no longer needed? a. Was this what you wanted? Would you have preferred something else? |

| |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [for participants who have and have not yet made disposition decisions about their surplus eggs] |
| 6. What do you think about the option of donating surplus eggs to research? a. Did you /would you ever consider donating eggs to research? Why/why not? b. Is there anything that would make you change your mind about this |
| 7. What you think about the option of donating surplus eggs to another person for reproduction? a. Did you/ would you ever consider donating eggs to another person? Why/why not? b. Is there anything that would make you change your mind about this? c. Do you know if there is a demand for donor eggs? How does this affect your thinking about donation to others? |
| 8. What do you think about the option of discarding your surplus eggs? a. Did you/ would you ever consider disposing of surplus eggs? Why/why not? b. Is there anything that would make you change your mind about this? |

Table 3: Factors that might help people to dispose of surplus eggs.

| Fixed choice options to the survey question <i>What factors would help you to dispose of surplus eggs? (Select all that apply)</i> | Participants with eggs still in storage: n | Participants who had relinquished eggs from storage: n | Total (n=46) |
|-------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|---------------------------------------------------------------|---------------------|
| Knowing how it is done | 13 | 1 | 14 |
| Being there when it is done | 3 | 2 | 5 |
| Having a religious person with me when it is done | 0 | 0 | 0 |
| Taking the eggs home myself to dispose of as I saw fit | 4 | 1 | 5 |
| Being able to specify how they should be disposed of by clinic staff (e.g., buried) | 4 | 1 | 5 |
| Other | 5 | 1 | 6 |
| Nothing would make me consider donating my eggs to someone else | 8 | 0 | 8 |
| I require no further information about this option | 6 | 8 | 14 |

Table 4. Factors that might help people to choose to donate surplus eggs to research.

| Fixed choice options to the survey question <i>What factors would help you to donate your surplus eggs to research?</i> (Select all that apply) | Participants with eggs still in storage: n | Participants who had relinquished eggs from storage: n | Total (n=48) |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|--------------------------------------------------------|--------------|
| Knowing the purpose of the research | 27 | 6 | 33 |
| Knowing how my eggs might be used in research | 26 | 7 | 33 |
| Knowing who the research team are | 11 | 3 | 14 |
| Meeting someone from the research team | 8 | 0 | 8 |
| Being paid/compensated to donate to research (eg reimbursed for storage fees, egg collection fees) | 24 | 3 | 27 |
| Finding out about the research outcomes | 25 | 3 | 28 |
| Other | 0 | 3 | 3 |
| Nothing would make me consider donating my eggs to research | 1 | 1 | 2 |
| I require no further information about this option | 2 | 1 | 3 |

Table 5: Factors that might help people to donate their surplus eggs to someone else

| Fixed choice options to the survey question <i>What factors would help you to donate your surplus eggs to an infertile person or a person who needs a donor egg because their eggs are not suitable for use ?</i> (Select all that apply) | Participants with eggs still in storage: n | Participants who had relinquished eggs from storage: n | Total (n=48) |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|--------------------------------------------------------|--------------|
| Knowing something about the recipient (e.g., age, income, religion) | 16 | 2 | 18 |
| Meeting the recipient | 7 | 1 | 8 |
| Having complete anonymity, so that the recipient and any resultant children won't know my identity. | 5 | 0 | 5 |
| Being paid/compensated for my donation (eg reimbursed for storage fees, egg collection fees) | 14 | 2 | 16 |

| | | | |
|-----------------------------------------------------------------|---|---|----|
| Other | 5 | 2 | 7 |
| Nothing would make me consider donating my eggs to someone else | 7 | 7 | 14 |
| I require no further information about this option | 4 | 0 | 4 |

Key message

We report on the factors that make decisions about the fate of frozen eggs difficult and propose strategies for improving this experience and facilitating the donation of surplus eggs. These include timely information, ongoing communication during egg storage, and insights into the experiences of donors, recipients, and donor-conceived families.



Dr Giuliana Fuscaldo is a researcher with the Monash Bioethics Centre. Giuliana's background is in bioethics, embryology and reproductive technology. Her research interests include the ethical issues that arise from advances in reproductive technology and ethical questions arising in clinical practice and health research.