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Organ Procurement Organization Perspectives on Normothermic Regional Perfusion Practices: A Qualitative Interview Study

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ABSTRACT

Background: Normothermic regional perfusion (NRP) increases the availability of quality transplantable organs. However, there are unresolved ethical challenges and variability in approaches to NRP facilitation across U.S. organ procurement organizations (OPOs). We sought to assess the landscape of OPO member perceptions on facilitating NRP.

Methods: Semi-structured interviews with OPO executives assessed their experiences collaborating with hospital partners, communicating with donor families, and training hospital personnel to implement NRP. Qualitative themes were elicited through deductive and inductive thematic content analysis.

Results: Twenty executives participated (53% participation rate). Five themes emerged: 1) comfort with allowing NRP procedures varied across and within donor hospitals and recipient transplant centers; 2) most participating OPOs lacked standardized operating procedures regarding case protocols and data collection protocols for NRP cases; 3) OPOs disclosed varied information about NRP during authorization conversations with donor families; 4) OPOs collaborated with donor hospitals and recipient transplant centers before, during, and after NRP cases; and 5) OPOs engaged in proactive educational efforts about NRP with partner hospitals before NRP cases are presented.

Conclusions: Our findings suggest that proactive, consistent, and cross-organization collaboration may help hospitals decide whether and how to adopt NRP and may help OPOs more effectively address challenges regarding the implementation of NRP. Future research should empirically assess NRP-related OPO practices.

Abbreviations: A-NRP: : Abdominal Normothermic Regional Perfusion; DCD: : Donation After Circulatory Death; ICUS: : Intensive Care Units; NRP: : Normothermic Regional Perfusion; OR: : Operating Room; OPOs: : Organ Procurement Organizations; OPTN: : Organ Procurement & Transplantation Network; The Alliance: : The Organ Donation and Transplantation Alliance; TA-NRP: : Thoracic Normothermic Regional Perfusion; U.S: United States

KEYWORDS
Transplantation; perfusion; interview; qualitative research

Introduction

Normothermic Regional Perfusion (NRP) is being used to expand the utilization of organs from donation after circulatory death (DCD) donors and improve transplant outcomes (Bekki et al. 2023; Wall et al. 2023). NRP allows for the expanded utilization of extended criteria DCD organs because it mitigates the risk of ischemic injury from the dying process and injuries sustained after the declaration of death by providing early oxygenated perfusion to the organs intended for transplantation. NRP involves the in-situ perfusion of either the thoracic (TA-NRP) or abdominal cavity (A-NRP) using a perfusion circuit designed to optimize oxygen delivery and salvage volume (Wall et al. 2024). The continuous warm blood perfusion of the donor organs presents several clinical advantages to traditional rapid recovery followed by cold storage, including reestablishing energy substrates and developing an environment to test for organ function

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early in the procurement process (Tingle et al. 2023). NRP determines which organs have the capacity to recover from the graft injury that occurs during the dying process, thereby decreasing the risk of primary non-function in recipients (Brubaker et al. 2023; Ran et al. 2024).

Despite its advantages, NRP introduces complex ethical and logistical challenges (American College of Physicians 2021). Ethical complexities include concern over potential violations of the dead donor rule, and uncertainty over public perceptions of the procedure (Entwistle et al. 2022). Organ Procurement Organizations (OPOs) are tasked with navigating these ethical and logistical challenges in the adoption and implementation of NRP.

A 2024 survey of U.S. OPO C-suite members and directors found that how OPOs operationalize NRP, collaborate with hospital partners, and train staff for NRP cases varies, and respondents expressed a desire for standardized guidance to reduce operational heterogeneity (Sellers et al. 2024). Although the American Society of Transplant Surgeons has published recommendations for standardizing NRP and the Organ Procurement & Transplantation Network (OPTN) has published proposed policies to ensure the safety of those donating through DCD pathways, NRP standards have yet to be mandated by the OPTN or universally adopted by U.S. OPOs (Fox and McMahon 2023; Croome et al. 2024). For example, the process by which OPOs obtain donor family authorization for NRP is not standardized, suggesting OPO uncertainty over what donor families should and should not be informed about the NRP process.

We examined U.S. OPO executives' perceptions about their collaborations with multiple transplant stakeholders in the authorization for and implementation of NRP. Our intent was to understand OPOs' NRP practices and communication strategies in order to devise future interventions that promote trust in the transplant process.

Materials and methods

Study design

We used a cross-sectional study design to assess OPO executives' perspectives on how their OPOs implement NRP cases and communicate with donor families about NRP through semi-structured qualitative interviews. The study was conducted at NYU Langone Health in New York, NY. The NYU Langone Health Institutional Review Board approved this exempt research study (IRB study #i23-01325). We used the Standards for Reporting Qualitative Research for quality reporting of our study design (O'Brien et al. 2014).

Participants and recruitment

We used convenience sampling to recruit current OPO executives within the U.S. out of a total of 55 OPOs, from 3/12/24-3/22/24. Eligible participants were 18 years of age or older and were a current employee of an OPO within the U.S. involved in NRP practices. The study team partnered with The Organ Donation and Transplantation Alliance (The Alliance) to recruit potential participants. A representative from The Alliance contacted OPO executives who attended their 2024 National Collaboration Forum on NRP to gauge their interest in participating. OPO executives then contacted the study team to express their interest. All participants provided verbal informed consent before the interview.

Data collection

We conducted semi-structured interviews from 3/20/24-4/16/24 either in-person at The Alliance's 2024 National Collaboration Forum or online *via* WebEx. Interviewers were a male Associate professor (BP) with a juris doctoral degree and a decade of experience in organ donation, procurement, and transplantation ethics and policy, and a female operations manager (CNS) with a bachelor's degree and 5.5 years of experience conducting and managing qualitative research studies. Interviewers were trained in qualitative interviewing techniques and had no pre-established relationships with participants (Patton 1999).

The interview guide was iteratively developed by the research team and guided by experts in qualitative research design, transplant research, and bioethics research (AEW, MLL, EJG, and BP). The interview guide included six open-ended questions designed to assess participants' perceptions of: 1) educational practices of NRP for their staff and hospital partners, 2) communication practices between their OPO, donor hospitals, transplant centers, and surgical teams for NRP cases, 3) methods used to monitor and evaluate NRP outcomes, and 4) communication practices for NRP authorization conversations with donor families (**Supp File 1**). Interviewees who represented OPOs that were not facilitating NRP were asked what had been done so far regarding NRP facilitation (i.e., conversations with hospital leadership, and NRP protocol development efforts). Demographic questions were covered toward the end of the interview and tracked *via* REDCap (Harris et al. 2009; 2019). OPTN regions

were identified after completion of the interviews. Interviews lasted an average of 17 min (range: 7-29 min), were audio-recorded, and auto-transcribed verbatim by Webex. During five interviews, the audio-recording of the interview malfunctioned; the interviewers took notes during the interview to supplement the transcripts. Participants were offered a $100 Amazon e-gift card after completing the interview.

Qualitative analysis

Two research team members reviewed and cleaned the transcriptions (AB and TF). We used a combination of inductive and deductive techniques to conduct a thematic content analysis (Tong et al. 2013; Saldana 2021). The study team deductively developed the codebook based on their experience studying the ethical and legal considerations of NRP and previous literature on NRP ethics and practices (Parent et al. 2020; Fife and Gossner 2024; Sellers et al. 2024). Coders (TF, CNS, and AB) conducted preliminary coding of one transcript during a working meeting to test the applicability of the codebook and inductively added codes based on the data (**Supp File 2**). Then, they coded another transcript separately and came together to refine the codes before moving onto formal coding.

Coding was conducted by one of the two interviewers (CNS) and two research team members trained in qualitative analysis techniques (AB and TF) using NVivo 14. Each transcript was coded by two of the three coders, two of which were not involved in data collection, to increase inter-rater reliability and reduce the potential for bias (MacPhail et al. 2016; Cofie et al. 2022). Eleven meetings were held among the three coders to reconcile all differences in coding and refine the codebook as necessary (MacPhail et al. 2016; Cofie et al. 2022). Once codebook alterations were made, coders went back into the previously coded transcripts to make corresponding edits to the codes. Coders wrote analytic memos throughout the coding process to note relevant findings (Morse 2015).

Once codes were finalized, a senior qualitative analyst with five years of qualitative research experience (KK) led the research team (AB and TF) through the process of identifying themes across the interviews. Members of the research team (KK, AB, and TF) met regularly to create and refine summaries of each code. Code summaries were then used to identify themes across the dataset. Themes were iteratively revised by senior members of the research team (EJG, AEW, MLL, BP).

Results

OPO executives from 38 of the 55 OPOs attended The Alliance's National Forum and were contacted for recruitment in this study and 23 expressed interest in participating. Twenty OPO executives provided informed consent and completed an interview (participation rate = 53%). Seventeen interviews were conducted in-person and three were conducted online. Three participants represented OPOs that were not implementing NRP at their partner hospitals, but these OPOs had initiated efforts to start NRP. Participants were primarily White ($n = 18$), female ($n = 15$), held various leadership positions within their respective OPOs, and represented OPOs from all but two OPTN regions (Table 1).

Five themes emerged including: 1) comfort with allowing NRP procedures varied across and within donor hospitals and recipient transplant centers; 2) most participating OPOs lacked standardized operating procedures regarding case protocols and data collection protocols for NRP cases; 3) OPOs disclosed varied information about NRP during authorization conversations with donor families; 4) OPOs collaborated with donor hospitals and recipient transplant centers before, during, and after NRP cases; and 5) OPOs engaged in proactive educational efforts about

Table 1. Sample population characteristics.

Characteristic	N (%)
Race	
White	18 (90)
Black or African American	1 (5)
Unknown / Not Reported	1 (5)
Ethnicity	
Not Hispanic or Latino	20 (100)
Hispanic or Latino	0 (0)
Gender	
Female	15 (75)
Male	5 (25)
OPTN Region[†]	
1	0 (0)
2	3 (15)
3	3 (15)
4	2 (10)
5	3 (15)
6	1 (5)
7	2 (10)
8	4 (20)
9	0 (0)
10	1 (5)
11	1 (5)
Organ Procurement Organization Role	
Recovery Supervisor	2 (10)
Chief Operating Officer	4 (20)
Director of Clinical Operations / Services	6 (30)
Vice President	3 (15)
Chief Executive Officer	2 (10)
Unknown / Unrecorded	1 (5)
Other	2 (10)

Note. $N = 20$.
[†]OPTN = Organ Procurement & Transplantation Network.

NRP with partner hospitals before NRP cases are conducted. Representative illustrative quotes for each theme can be found in Table 2.

Comfort with allowing NRP procedures varied across and within donor hospitals and recipient transplant centers

When asked to describe challenges faced by OPOs in moving NRP cases forward, participants commonly mentioned that hospital perceptions of the ethical permissiveness of NRP were a challenge. Participants reported that comfort levels with NRP varied across and within donor hospitals and recipient transplant centers. Participants related that hospitals' policies within each donor service area regarding NRP ranged from not allowing DCD in general, not allowing TA-NRP, and allowing both TA-NRP and A-NRP.

When describing conversations with hospital personnel about implementing NRP, some participants used the term "comfort" and reported an easy-going experience (e.g., "it's just been smooth"). Participants reported that hospitals comfortable with NRP perceived that NRP maximizes the gift of life from deceased donors by increased organ utilization leading to superior outcomes compared to rapid recovery. Others

Table 2. Representative Illustrative Quotes from Organ Procurement Organization Executives by Theme.

Theme	Representative Quote 1	Representative Quote 2
1. Comfort with allowing NRP procedures varied across and within donor hospitals and recipient transplant centers	"We've had variable success and hospitals have pushed back and said, no, we don't want to do that because of what they've heard and others, it's just been smooth…so, it's sort of been all over the place." (ID 4)	"The biggest the largest common denominator from all of [the hospitals who have pushed back against NRP] is usually ethical concerns that they are pushing us back to their administration, who is then in turn, pushing it back to their ethics to have a deeper dive. We have actually in 3 [out of] 3 of our major hospitals have been halted, not allowed to be doing [NRP] until ethics has made a decision on it." (ID 12)
2. Most participating OPOs lacked standardized operating procedures regarding case protocols and data collection protocols for NRP cases	"What we have noticed is that there are a lot of people doing this don't have very much experience and the lack of standardized protocols is a real challenge for us as an OPO, because you don't know what you're going to get until you get it." (ID 11)	"We want to trend organ function post-transplant. So, we work with transplant centers in order to get that, that data… So, we follow up on, you know, we follow up on all of those. We also participated with a multiple, you know, with multi centers on, on a study that was just published in JAMA…surgery in April. It was a large center study on the outcomes of liver super rapid recovery versus NRP and it showed the clinical superiority of this technique for, for livers." (ID 5)
3. OPOs discussed varied information about NRP during authorization conversations with donor families	"With [TA-NRP], because there is a re-animation of the heart… We just want everything on the table. 'Are you, okay with this new way of accepting hearts and lungs from donors? Or would you just prefer we do it the old way'…It's only happened once now, because it was the other night, and they said, yes, so right now we're kind of giving them more detail than we would normally give in an organ procurement, but we feel like we need to right now." (ID 10)	"If a family seems receptive or more interested in more detail than we provided, then the broad 'this is a mechanism to recover organs and it has shown to get more organs transplanted', we'll go there with them. But, um, we haven't yet framed up the information piece… preemptively…but a big piece of this is, it's important to me and to us, is that we haven't yet convened a representative group of donor families. We believe it's important to try to understand what families want to know and need to know, rather than assume and/or dictate" (ID 6)
4. OPOs collaborated with donor hospitals and recipient transplant centers before, during, and after NRP cases	"Once we learn, it's an NRP case… we then communicate that out internally, and also externally meaning we will put it in donor highlights and say, hey, listen, this is an NRP case the liver team is accepting, please know, this. Um, so then we communicate with all of the teams, uh, throughout the case to let them know what the actual procedure is gonna be. We get closer to the operating room time, we'll have a huddle with all of the, uh, transplant center [staff that] is involved to talk number one about the procedure in general. What organs are going and by what technique?" (ID 18)	"Partnering with [the] university, who is our biggest provider of NRP, and we work together to create a process for a very strategic plan and how we approach things. So we want to make sure we have systematic processes. Um, so we've created, um, help them create a roadmap as well as a protocol for every case. So that's kind of the internal transplant center OPO piece." (ID 2)
5. OPOs engaged in proactive educational efforts around NRP with partner hospitals before NRP cases are presented	"Our medical director went out. And, educated other communities and other hospitals. He did some grand rounds at the bigger hospital center…. And there was a pediatric, I think it was an alliance pediatric conference where two of our pediatric intensive care doctors went to and that was very instrumental in moving NRP along because we've done two infants since then." (ID 16)	"We bring some swag. We bring some bagels. We set up on their ICUS, and we're there to answer any questions that [hospital staff] have about and then they can also look themselves without feeling pressure from us or feeling pressure from a timeline. They can [access] all the things that they want, look at, read it and then see what they think about it and then they ask us their questions." (ID 3)

Note: NRP = normothermic regional perfusion; OPO = organ procurement organization; ICUS = intensive care units; TA-NRP = Thoracic Normothermic Regional Perfusion.

reported major "pushback" or "concerns" (e.g., "despite every effort at education… [hospitals] just are not yet comfortable with the concept"). Participants related that hospitals' discomfort with NRP pertained to ethical concerns including the dead donor rule, irreversibility, and ligation of the head vessels (TA-NRP only).

Participants agreed that variation in comfort with NRP procedures within hospitals (especially among hospital staff) contributed to delays or even full "pauses" on NRP cases. Delays occurred because hospital staff who were concerned about NRP escalated the decision on whether to pursue NRP to chief medical officers and ethics committees. Participants reported implementing proactive and consistent training of hospital leadership and staff members to "overcome" concerns around NRP. Some participants commented that some clinicians within the hospital (i.e., nurses and anesthesiologists) were more likely to be uncomfortable with NRP than other types of clinicians. For example, two stated that anesthesiologists have the highest level of discomfort with NRP and conjectured that "anesthesiologists are just not going to reintubate a dead patient."

Most participating OPOs lacked standardized operating procedures regarding case protocols and data collection protocols for NRP cases

Respondents cited a lack of standardized operating procedures as a major barrier to facilitating all facets of NRP cases. These participants expressed the need for the standardization of data collection procedures, and case protocols (e.g., authorization processes, supplies, and OR staff requirements).

Although participants commonly reported that they track outcomes related to NRP through collaboration with recipient transplant centers, reports of the data collected and the methods used to obtain the data varied substantially. This reported variation in data collection procedures ranged from data on the details of the recovery procedure (e.g., serial lactates), the number of organs recovered, and organ function post-transplant. An example of differences in data collection procedures reported by one participant was that OPOs do not collect or monitor data on NRP outcomes consistently and that their OPO's electronic system does not have a field to track NRP-specific outcomes.

Participants reported that OPOs typically follow the recovery team's lead during NRP cases, even though some recovery teams do not have a standardized operating procedure for NRP cases. Some noted that in these cases, donor hospital staff were trained in real time, characterized as "trial by fire." A handful of participants said that they partnered with donor hospital leadership and staff to develop protocols and training materials to avoid these situations. Another mentioned that their OPO was in the process of developing an OPO-based A-NRP recovery program to standardize the process across donor hospitals.

OPOs disclosed varied information about NRP during authorization conversations with donor families

Participants' perceptions of the level of detail their OPO shared with donor families about NRP varied substantially. Perceptions ranged from sharing explicit details with donor families about what NRP entails, sharing only certain aspects of the process (e.g., "premortem cannulation"), and describing NRP as a "perfusion and preservation technique" without emphasizing how it differs from other recovery methods. One participant mentioned that the detail discussed with donor families across OPOs was "kind of all over the place." Some participants reported that they solicited feedback from donor families through Patient Advisory Councils on how to communicate with donor families about NRP during donor authorization conversations.

Participants commonly reported that their OPO shares "high level" or "vague" information on the NRP process with donor families (e.g., reassuring donor families that their loved one will receive "normal end of life care," and that the recovery team will "perfuse the organs in their body, instead of removing them and perfusing them after they're removed"). Some of these participants said that they answer follow-up questions from donor families who ask for additional details on the procedure. Multiple participants that reported sharing limited information with donor families justified their communication strategy by making comparisons to other recovery techniques and how those are not detailed in the informed consent process. Some reported that they do not share any information on NRP unless the families ask for it and cited reasons like, "we don't want to add to their grief."

Other participants reported that they consistently share detailed information including "the process and the procedure," "the friction points," and "the head vessels being occluded and the heart restarting." Those sharing detailed information with donor families attributed a need for "transparency" as a motivation for this decision. One of these participants said that they only share specific details about the process for TA-NRP and not for A-NRP.

OPOs collaborated with donor hospitals and recipient transplant centers before, during, and after NRP cases

Participants agreed that consistent collaboration between OPOs, donor hospitals and recipient transplant centers before, during, and after NRP cases helps facilitate current and future NRP cases. Reported collaborative efforts that have been implemented included cross-organizational communication shortly after NRP cases have been presented and sharing of NRP case outcomes after donations have occurred.

Participants related that their OPO meets with donor hospitals and recipient transplant centers before each NRP case (e.g., *via* Zoom) and at the donor hospital before the staff enters the operating room (OR) to "ensure all the logistics are talked through" and to "talk through everybody's roles and expectations." These meetings were usually described as "huddles." Participants reported that "huddles" with hospitals were "make or break" for NRP cases because "there's so much variation" in NRP protocols across hospital teams. Participants said that these pre-case "huddles" build mutual understanding of the process between OPOs and hospitals in their service areas. An example of how these "huddles" facilitated NRP cases, as reported by two participants, entailed collaborating with multiple recipient transplant centers to facilitate thoracic rapid recovery and A-NRP for a single donor. An example of the shortcomings of these "huddles" reported by one participant was that some hospital teams were unaware that NRP was to be utilized even after pre-case "huddles" occurred. This participant suggested that "the correct team players" may not have been involved in the conversation.

Participants also emphasized the importance of consistent communication between OPOs and recipient transplant centers when sharing NRP case outcomes (e.g., number and type of organs recovered, number of organs transplanted, and recipient graft health). Reported benefits of consistent sharing of NRP case outcomes included publishing papers on NRP outcomes and revising hospital policies (i.e., policy on extended withdrawal recovery time).

OPOs engaged in proactive educational efforts about NRP with partner hospitals before NRP cases are presented

When asked how their OPO educates hospital partners on NRP, participants said that they educate and "engage" hospital leadership (e.g., medical executives and C-suite members) first to gain buy-in for the practice of NRP, and then hospital staff (e.g., OR and Intensive Care Unit staff) to ensure mutual understanding and acceptance of NRP because "not everybody sees the issue the same way." Participants regarded proactive education as a means for hospital leadership and staff to learn and ask questions about NRP ahead of time, as opposed to in real time when an NRP case is presented. Participants consistently agreed that proactively educating hospital staff and leadership facilitates NRP because it ensures that "everybody you know, knows what's gonna happen."

Participants reported that their OPO has educated partner hospitals on NRP using a range of educational modalities (e.g., handouts, webinars, and on-site meetings). Some noted that their OPO adapted existing educational materials to create NRP-specific content (i.e., materials about DCD and Vascularized Composite Allotransplantation) or used NRP-specific materials created by other OPOs. Others partnered with hospitals in their service area, bioethics organizations, and donor families to create educational materials for partner hospitals.

Discussion

In this qualitative interview study, we found that there is reported variation in NRP practice across OPOs and individual hospitals. OPO executives described a range of comfort levels with implementing NRP across and within partner hospitals, NRP training protocols and educational efforts for partner hospitals, data collection procedures, and levels of transparency with donor families about the procedure. They also discussed strategies that facilitated NRP cases such as pre-case "huddles" and proactive education among hospital staff.

A major finding was that OPOs navigate varied levels of discomfort across partner hospitals and even within hospitals among different staff members (Sellers et al. 2024). This range reflects unresolved ethical issues around NRP such as concerns about violating the dead donor rule and whether NRP meets the irreversibility requirement of the legal definition of death (Murphy et al. 2025). It also highlights a baseline unfamiliarity with NRP procedures at donor hospitals. Some OPO executives expressed that they encounter hospitals that refuse to allow TA-NRP, citing ethical concerns with the practice that differentiate it from A-NRP (American College of Physicians 2021; Sellers et al. 2024). While TA-NRP and A-NRP both require clinicians to restart circulation and occlude blood flow from reaching the brain (A-NRP occludes lower down in the body), only TA-NRP restarts heart

function and occludes blood flow closer to the brain. Therefore, the ethical concern about restarting the heart beat in the body and heightened concern about potential blood flow to the brain applies only to TA-NRP and explains why some donor hospitals only allow A-NRP (Bernat et al. 2023). Others noted that partner hospitals do not allow any NRP recoveries because of discomfort with reintubating a dead patient. Reintubation is necessary in all DCD cases where the lungs are to be used for transplantation and is not done in A-NRP cases with no plan for thoracic organ recovery, which warrants discussion about whether this aspect of NRP is ethically distinct from rapid recovery DCD, but this discussion is beyond the scope of this paper.

Several participants discussed the benefits of gathering representatives from the OPO, the donor hospital, and the recipient transplant center in a "huddle" before the case begins to discuss the protocol and necessary resources from each group (Croome et al. 2024; Sellers et al. 2024). These "huddles" were framed as critical for establishing a shared understanding of NRP processes, especially in the current environment where donor hospitals have varied experience levels, comfort levels, and protocols for NRP cases. Participants described that failing to inform donor hospital staff about the potential use of NRP has resulted in cases being paused while concerned hospital staff consulted ethics committees. Standardization of NRP procedures should include guidance on cross-team communication, including which hospital personnel to involve in pre-arrival "huddles."

Participants reported that proactive educational efforts with partner hospital leadership and staff increased their comfort with NRP because it gave them an opportunity to learn about the procedure and ask questions. However, the effectiveness of these reported educational efforts on improving hospital staff or leadership knowledge about or attitudes toward NRP has not yet been assessed. Interventions to educate hospital staff about NRP should provide clinical decision support, clearly define clinical and patient outcome benefits of NRP, review both sides of the ethical debates surrounding the practice, and consider the cross-organizational context relevant to NRP cases (Keyworth et al. 2018; Portela Dos Santos et al. 2022). Additionally, not every donor hospital in the U.S. has been exposed to NRP because DCD donation is a low volume procedure. Therefore, widespread educational efforts may be problematic because they may be done years in advance of an NRP case occurring at a donor hospital and not every hospital staff member will be involved in NRP cases (Wall et al. 2022). OPOs should carefully consider how to effectively educate hospital staff about NRP and which staff members to educate (Sellers et al. 2024).

Protocols for NRP cases must align with the interests of the stakeholders involved in organ donation and transplantation and participants described implementing a range of protocols (Croome et al. 2024). OPOs are incentivized to maximize the gift of life from deceased donors (i.e., the number of organ donors and the number of organs used for transplantation per donor). Recipient hospitals are responsible for waiting list and recipient outcomes and are incentivized to transplant patients promptly while maintaining high quality outcomes. Donor hospitals must prioritize care for the patient prior to donation and express respect for the wishes of the donor and donor family. Additionally, donor hospital teams new to implementing NRP may require additional guidance (e.g., expectations of hospital staff) during the recovery process from both procurement teams and OPO staff.

Our participants also reported that data collection on NRP procedures is not standardized, making it challenging for OPOs to track and report metrics associated with NRP. The Health Resources and Services Administration published a recent directive to OPTN requesting standard practices around patient safety and data collection for OPOs using NRP (Formica and Wyse Morrissette 2025). Moreover, several recent publications have called for more specificity in data collection for NRP cases at a national level to be able to better understand the impact on these procedures on transplantation rates and outcomes (Wall et al. 2025; Wisel et al. 2025). Our results support OPO interest in a national effort to identify best practices for NRP procedures and data collection.

Another way the NRP process has yet to be standardized is the authorization conversation with donor families. Some participants reported that their OPOs disclose only "high level" information about the procedure as they do with other types of recovery methods, while others reported sharing detailed information on the "friction points" of the procedure for transparency. This variation highlights the tension between the ethical principles of autonomy and nonmaleficence in regard to communication with donor families (DeCamp et al. 2022; James et al. 2022). Respecting the autonomy of the donor (by way of the donor family) would require disclosure of information sufficient to allow donor families to make an informed choice about whether their loved one would have agreed to NRP (Croome et al. 2024). However, disclosing detailed information about the procedure could be traumatic to families in crisis (Dudzinski

et al. 2024). This dilemma is not unique to NRP. Other disciplines (e.g., oncology) have debated whether informing patients enables autonomy or overburdens them (e.g., cancer prognoses) (Melis et al. 2020; van der Velden et al. 2020; Hui et al. 2021; Nakazawa et al. 2022). Patients and families who have first-hand experience navigating difficult conversations, like donor authorizations, should inform protocols detailing what to disclose. Interviewees reported soliciting feedback from donor families on their OPO's donor authorization scripts but did not report whether these efforts improved donor authorization conversations or authorization rates. Future research should assess the effectiveness of community partnerships in developing and implementing NRP protocols and on family authorization rates.

Our findings must be framed in light of their limitations. First, we sampled one representative from each OPO who held a leadership position, so their perceptions may have differed from other OPO employees, particularly those who have firsthand experience in discussing NRP authorization with donor families. However, sampling representatives with an oversight role allowed them to speak to multiple aspects of their OPO's NRP protocols and the challenges faced by leadership in facilitating NRP at multiple partner hospitals. Second, we interviewed 53% of those who were contacted for recruitment, but our sample was limited to OPO executives who attended The Alliance's National Forum on NRP ($n = 38$). Therefore, our sample was prone to selection bias in that those who attended the forum may have been more supportive of NRP compared to those who did not attend. However, we interviewed OPO executives representing all but two OPTN regions (1 and 9) and did not make any assertions on the prevalence of NRP facilitation among OPOs in the U.S. Third, our findings are representative of participants' self-reports, and were not validated through other sources. Protocols for NRP cases, including donor authorization procedures, should be empirically assessed. However, we inquired about current practices and interviewers emphasized the confidentiality of responses, making results less prone to recall or social desirability bias. Finally, these interviews were conducted in 2024, and NRP practices at participating OPOs may have evolved since the data was collected. Even though the use of NRP has increased dramatically in the last half decade, debates persist around the ethical permissibility of NRP, the information needs of donor families for NRP authorization, and best practices for NRP implementation across care teams (Murphy et al. 2025; Ramos and Beers 2025; Royo-Villanova et al. 2025; Sambommatsu et al. 2025; Turan 2025; Walker et al. 2025; Wall et al. 2025; Liebman and Parent 2026 July 24). Therefore, the themes identified through these interviews conducted in 2024 remain relevant to the scientific discourse and related challenges have yet to be resolved.

In conclusion, substantial variation exists in the implementation of NRP, OPO communication about NRP to donor families, and the attitudes of hospital personnel involved in NRP cases. Understanding this variation can inform strategies for consistent and transparent NRP practices to improve communication with donor families and promote trust in the transplantation process. Our findings suggest that proactive, consistent, and cross-organization collaboration may help hospitals decide whether and how to adopt NRP and may help OPOs more effectively address challenges regarding the implementation of NRP.

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Disclosure statement

The authors of this manuscript have conflicts of interest to disclose. Dr. Wall is the medical director of Regional Perfusion Services, LLC, a company that provides perfusionist support for NRP directly to OPOs and transplant centers. Her involvement is to support protocol development and quality improvement for the organization. Dr. Parent is a member of the Scientific and Ethics Advisory Board of Procure OnDemand. He provides ethics guidance for their organ recovery service protocols. He is also a member of the Ethics Advisory Board for Bexorg, Inc. and ethics consultant to LiveOnNY. Dr. Levan reported

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Data availability statement

The data supporting this study cannot be made available.

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