

Incompatible Kidney Donor Candidates' Willingness to Participate in Donor-Exchange and Non-directed Donation

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Although paired donation, list donation and non-directed donation allow more recipients to receive living donor transplants, policy makers do not know how willing incompatible potential donors are to participate. We surveyed 174 potential donors ruled out for ABO-incompatibility or positive cross-match about their participation willingness. They were more willing to participate in paired donation as compared to list donation where the recipient receives the next deceased donor kidney (63.8% vs. 37.9%, $p < 0.001$) or non-directed donation (63.8% vs. 12.1%, $p < 0.001$). Their list donation willingness was greater when their intended recipients moved to the top versus the top 20% of the waiting list (37.9% vs. 19.0%, $p < 0.001$). Multivariate logistic regression modeling revealed that potential donors' empathy, education level, relationship with their intended recipient and the length of time their intended recipient was on dialysis also affected willingness. For paired donation, close family members of their intended recipient (odds ratio (OR) = 3.01, confidence intervals (CI) = 1.29, 7.02), with high levels of empathy (OR = 2.68, CI = 1.16, 6.21) and less than a college education (OR = 2.67, CI = 1.08, 6.61) were more willing to participate compared to other donors. Extrapolating these levels of willingness nationally, a 1–11% increase in living donation rates yearly (84–711 more transplants) may be possible if donor-exchange programs were available nationwide.

Key words: Donor exchange, ethics, kidney, living donors, non-directed donation, psychosocial

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Introduction

In the past decade, there has been an explosion of interest in donor-exchange and non-directed donation programs (1–7). Blood-type and cross-match incompatibility exclude approximately one-third of potential living donors from donating directly to their intended recipients (8). Donor-exchange programs, where an ABO- or cross-match-positive incompatible donor donates to another recipient so that his or her intended recipient will receive a kidney from another living donor (i.e. paired donation) or the deceased donor pool (i.e. list donation), provide innovative alternatives for facilitating living donation. They also allow more recipients to receive the health benefits of living donor kidneys (6,9–15) and are more cost-effective when compared with patients remaining on dialysis or undergoing desensitization protocols or deceased donor transplantation (8,16). As of November 18, 2005, 130 living donors have donated their kidneys through donor-exchange and 332 donors have donated through non-directed donation programs (17).

Although these programs may significantly increase the rates of living donor transplants, there are also practical and ethical considerations that might influence how many donors would participate (12,13,18–20). First, since donors participating in paired donation often travel to the recipients' transplant center for donation, they may have to pay additional travel costs and recover at an unfamiliar transplant center (8,21). Second, reluctant potential donors who are afraid of publicly expressing their desire not to donate cannot use a blameless medical excuse to opt out of donation (22,23). Third, after donating their kidney through list donation, donors might wait for months or years until a deceased donor kidney matches their intended recipient, and for some intended recipients, particularly those who are highly sensitized (19,20), a matching kidney may never come. Finally, donors who participate in non-directed donation may have a less positive donation experience, as they may not witness the recipient's improved quality of life afterward (7,24).

To date, much of the ethical debate about these programs has occurred among transplant professionals and has not included the attitudes of potential donors eligible for these programs. Therefore, we conducted a study of 174 ruled-out potential living donors to determine: (1) their willingness to participate in donor-exchange and non-directed donation programs, (2) which demographic and personality characteristics are predictive of increased willingness and (3) how these levels of willingness might hypothetically translate into increased rates of living donor transplantation every year.

Methods

Participants

We surveyed potential living kidney donors who were evaluated by Barnes-Jewish Transplant Center in St. Louis, Missouri and Shands Hospital Kidney & Pancreas Transplant Center in Gainesville, Florida between January 2004 and May 2005, and ruled out due to ABO-incompatibility (34%) or a positive cross-match (66%). Potential donors were excluded from the study if they were minors or had a health problem prohibiting them from being a donor (i.e. history of high blood pressure, diabetes, cancer, hepatitis, heart, kidney or lung disease).

Survey measures

Demographic and personality characteristics: Transplant professionals at Barnes-Jewish Transplant Center, including a psychologist trained in survey development (AW), designed the survey instrument and pilot-tested it with ruled-out potential living donors to improve question phrasing and establish face validity. We first measured patient demographics and two personality traits, empathy and interpersonal guilt, to examine why potential donors would be motivated to participate in donor-exchange or non-directed donation. Empathy, defined as 'regard and sympathy for another's feelings,' was measured using the 8-question Empathic Concern subscale of the Interpersonal Reactivity Index (25–27) and indicated the potential donor's level of healthy concern for the intended recipient. Interpersonal Guilt, defined as 'an exaggerated sense of responsibility for the well-being of others', was measured using the 14-question Omnipotent Responsibility Guilt subscale of the Interpersonal Guilt Scale (28) and indicated the potential donor's level of guilt about the intended recipient's health.

General attitudes about and willingness to participate in donor-exchange programs: We asked potential donors to rate their agreement with two general statements about donor-exchange, 'More recipients will be able to get a kidney transplant because of donor-exchange programs,' and 'If I donated my kidney to a stranger through a donor-exchange program, I trust that my intended recipient would receive the transplant benefits promised,' using a 4-point Likert scale ranging from 'strongly agree' (1) to 'strongly disagree' (4). We defined four programs: paired donation, list donation where the intended recipient would receive the next deceased donor kidney, list donation where the intended recipient would be moved into the top 20% of the waiting list and non-directed donation using definitions available in the literature at the start of the project (13) (Appendix 1). Potential donors rated how willing they would be to participate in each program on a scale ranging from 'very unwilling' (1) to 'very willing' (10). After rating their willingness, they explained what influenced their decision and we recorded their responses verbatim to allow for qualitative analysis.

Procedure

After receiving IRB approval from Washington University School of Medicine and the University of Florida, Gainesville, we conducted a 30-min

telephone interview. During the study, no donor-exchange programs were available at either hospital. Potential donors did not receive any financial compensation for participating in the study.

Data analysis

Using the Statistical Package for the Social Sciences Version 12.0 (SPSS Inc., Chicago, IL), we conducted basic descriptive analyses to determine potential donors' general attitudes about and willingness to participate in donor-exchange and non-directed donation. We used the McNemar test of correlated proportions to determine if any differences between willingness (1–7 vs. 8–10) to participate in each program emerged.

We then created a set of categories for why potential donors were willing or unwilling to participate in different programs using patients' qualitative explanations. Two raters independently coded the qualitative willingness explanations using these codes. The raters had an original inter-rater reliability of 90%, and resolved any coding differences until 100% consensus was reached. We then conducted descriptive statistics to determine what potential advantages willing potential donors (willingness ratings ≥ 8) saw and what concerns unwilling potential donors (willingness ratings < 8) had about each program.

Finally, we conducted logistic regression, using odds ratios (OR) and confidence intervals (CI), to determine significant predictors of increased willingness to participate in paired donation, list donation where the intended recipient received the next deceased donor kidney and non-directed donation. Since potential donors' mean willingness differed significantly across programs, we examined how willingness varied across levels of the demographic variables for each program, and selected a threshold for the dependent variable that best represented this variation. We then conducted multivariate logistic regression modeling to predict willingness by age ('<45' vs. '45+'), education level ('Less than a Bachelor's degree' vs. 'Bachelor's degree or higher'), marital status ('Married' vs. 'Not'), potential donor's relationship to intended recipient ('Close family member or spouse' vs. 'Other'), time on dialysis ('Never' vs. '<1 year' vs. '1 year or more') and levels of empathy (median split, 'High' vs. 'Low'). Gender, race, employment status, number of prospective donors and interpersonal guilt were also examined, but because they were not significantly associated with willingness at the univariate level, were removed from the final multivariate modeling.

Results

Participants

Of the 1027 potential donors evaluated by Barnes-Jewish Transplant Center and Shand's Hospital during the study period, 308 (30%) were found through chart review to be ruled out for ABO- or cross-match incompatibility. After removing the 71 potential donors who had incorrect telephone numbers from the study sample, of the 237 remaining ruled-out potential donors, 174 were interviewed, 39 declined and 24 could not be reached (response rate: 73%). The 237 potential donors surveyed were being evaluated for 150 intended recipients.

Intended recipients were on dialysis for 2.4 years (SD = 3.73) before their potential donors were evaluated. The majority of potential donors were Caucasian (81%) and female (63%) (Table 1). This study sample was generally comparable in race (81% vs. 70% Caucasian) and gender (63% vs.

Table 1: Demographics of 174 potential donors

	Mean (SD)	%
Age	43.16 (11.9)	
Gender		
Male		37
Female		63
Race		
Caucasian		81
African American		18
Other		1
Marital status		
Single		34
Married or domestic partner		66
Education		
High school degree or less		27
Some college		40
College graduate or higher		33
Employment		
Full time		70
Part time		12
Other employment status		18
Reason for incompatibility		
Cross-match positive		66
ABO-Incompatible		34
Potential donors' blood type		
O		32
A		32
B		12
AB		2
Unknown		22
Relationship to intended recipient		
Sibling		15
Spouse		14
Parent		13
Child		3
Other relative		29
Friend or other relationship		26

58% female) to national data on actual living donors since 2000 (17), but included more extended family members (29% vs. 7%) of intended recipients.

Donor-exchange attitudes and willingness

Ninety-seven percent of potential donors (46% strongly) agreed that more intended recipients will be able to get a kidney transplant because of donor-exchange programs. Ninety-four percent believed (34% strongly) that their intended recipient would receive the donor-exchange transplant benefits promised if they participated in donor-exchange. Potential donors were significantly more willing to participate in paired donation, compared to participating in either list donation program (next deceased donor kidney: 63.8% vs. 37.9%, $p < 0.001$; top 20% of waiting list: 63.8% vs. 19.0%, $p < 0.001$) or non-directed donation (63.8% vs. 12.1%, $p < 0.001$) (Figure 1). Potential donors were also significantly more willing to participate in list donation when their intended recipients moved to the top of the waiting list as compared to only being moved into the top 20% of the waiting list (37.9% vs. 19.0%, $p < 0.001$).

Qualitative analysis further elucidated the reasons for potential donors' positive attitudes about donor-exchange programs. Potential donors wanted to participate in donor-exchange primarily to help improve their intended recipients' health and quality of life (74%) (Table 2). Potential donors also liked that the paired donation program allowed them to help two people—their intended recipient and the other person to whom they donated (30%), and that both intended recipients would get transplants at the same time (28%). In regard to list donation, many potential donors explained that they were willing to participate, because they saw the possibility of reducing their intended recipients' waiting time for a deceased donor kidney (43%).

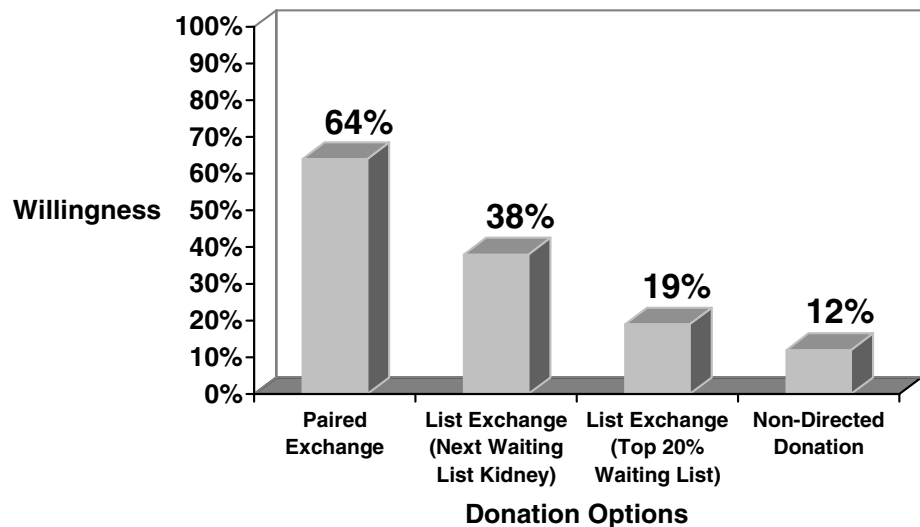


Figure 1: Potential donors' willingness to pursue alternative donation options. The percentage of donors rating their willingness as ≥ 8 out of 10 for each program. Potential donor willingness to participate in paired donation was significantly greater than every other program, $p < 0.001$.

Table 2: Preferences for and against donor-exchange

	Agreement # (%)
General reasons supporting donor-exchange ¹	
To help improve intended recipient's health and quality of life	85 (74%)
To help people in general—non-directed motivation	23 (20%)
Specific reasons supporting paired donation ¹	
To help two people—the intended recipient and another person who needs a kidney	34 (30%)
Both recipients will receive a kidney at the same time	32 (28%)
Specific reasons supporting list donation (next deceased donor kidney) ¹	
Being next on the deceased donor transplant list will increase the possibility of getting a transplant	49 (43%)
Specific reasons supporting list donation (top 20% of waiting list) ¹	
Moving up on the deceased donor transplant list will increase the possibility of getting a transplant	22 (19%)
General reasons against donor-exchange ²	
Intended recipient may not receive a kidney	54 (34%)
Potential donor, intended recipient, or family members are uncomfortable with donation in general	22 (14%)
Only want to donate to my intended recipient	20 (12%)
Specific reasons against list donation (top 20%) ²	
Moving up on the deceased donor transplant list will not increase the possibility of getting a transplant	51 (32%)
Intended recipient will not receive the health advantages of a living kidney	16 (10%)
Specific reasons against non-directed donation ²	
Only want to donate to my intended recipient	50 (31%)
Want to save my kidney for another loved one who may need it in the future	22 (14%)

¹We included patients' reasons for supporting donor-exchange if they reported willingness (ratings ≥ 8) to participate in at least one program (N = 115). The number and percentage of 'N' who agreed with specific reasons for any programs they supported are indicated in the 'Agreement #' column.

²We included patients' reasons against donor-exchange if they reported unwillingness (ratings < 8) to participate in at least one donor-exchange programs (N = 161). The number and percentage who agreed with any specific reason against participation are indicated in the 'Agreement #' column.

On the other hand, potential donors who were unwilling to participate in donor-exchange expressed concern that their intended recipient would not be guaranteed a kidney if they donated (34%), were uncomfortable with donation in general (14%), or did not want to donate to someone they did not know (12%) (Table 2). Some potential donors were concerned that their intended recipient would not receive a functioning kidney, saying, 'This is a good option if both kidneys are considered compatible and comparable. . . My concern is that one transplant or situation may go better

than the others and there would be regret and hard feelings.' Questions about the equity of list donation programs sometimes emerged (32%). One potential donor stated, 'The recipient's been on the list for years already and I don't believe [list donation programs] would make a difference in getting him a transplant.' Another potential donor stated, 'I don't think this program is fair to others on the list. Those people all have families who love them and want them to receive a kidney. My recipient is not the sickest person on the list. She shouldn't automatically be put to the top.'

Non-directed donation attitudes and willingness

Potential donors were least interested in participating in non-directed donation as compared to paired donation (12.1% vs. 63.8%, $p < 0.001$) or either list donation program (next deceased donor kidney: 12.1% vs. 37.9%, $p < 0.001$; top 20% of waiting list: 12.1% vs. 19.0%, $p < 0.001$) (Figure 1). Potential donors who were willing to participate in non-directed donation simply wanted to help others (15%). Potential donors who were unwilling explained that they wanted their intended recipient to benefit from their donation (31%) or to save their kidney for another loved one who may need it in the future (14%).

Predictors of interest in donor-exchange and non-directed donation

Multivariate logistic regression modeling revealed that potential donors' empathy, education level, relationship with the intended recipient and the length of time intended recipients were on dialysis affected their willingness to participate in donor-exchange and non-directed donation. Potential donors who were close family members of the intended recipient (OR = 3.01, CI = 1.29, 7.02), who had high levels of empathy (OR = 2.68, CI = 1.16, 6.21) and who did not have a college degree (OR = 2.67, CI = 1.08, 6.61) were significantly more willing to participate in paired donation than other potential donors (Table 3). For list donation, compared to potential donors whose intended recipients were not yet on dialysis, potential donors whose intended recipients were on dialysis either less than 1 year (OR = 4.64, CI = 1.30, 16.61) or 1 year or more (OR = 4.14, CI = 1.19, 14.38), and who were high in empathy (OR = 2.61, CI = 1.03, 6.64) were more willing to participate. Finally, potential donors were more willing to participate in non-directed donation if they were high in empathy (OR = 4.24, CI = 1.02, 17.63) and were not close family members of the intended recipient (OR = 0.11, CI = 0.02, 0.57).

Increase in transplant rates possible with donor-exchange

Published national estimates of the number of ABO- or cross-match-positive donor/recipient pairs ruled out every year range from 884 to 4443 (19,29). Because of recipient sensitization and other reasons (8), only half of these intended recipients (442–2222) are likely to receive a transplant through donor-exchange programs. To develop a conservative estimate of how many ruled-out potential donors

Table 3: Relative willingness to participate in donor-exchange and non-directed donation

Predictors ¹	Paired donation (10 vs. 1–9)	List donation (9–10 vs. 1–8)	Non-directed donation (8–10 vs. 1–7)
Potential donor's relationship with intended recipient			
Close family vs. other	OR = 3.01 (CI = 1.29, 7.02)	ns	OR = 0.11 (CI = 0.02, 0.57)
Education level			
Less than college vs. college degree	OR = 2.67 (CI = 1.08, 6.61)	ns	ns
Level of empathy			
High vs. low	OR = 2.68 (CI = 1.16, 6.21)	OR = 2.61 (CI = 1.03, 6.64)	OR = 4.24 (CI = 1.02, 17.63)
Length of time on dialysis			
<1 year vs. never	ns	OR = 4.64 (CI = 1.30, 16.61)	ns
1 year + vs. Never	ns	OR = 4.14 (CI = 1.19, 14.38)	ns
Marital status			
Not married vs. Married	ns	ns	ns
Age			
<45 vs. 45+	ns	ns	ns

¹Gender, race, employment status, number of potential donors, city size (rural/urban), self-efficacy and interpersonal guilt were not significant ($p < 0.10$) at the univariate level and, thus, were not included in the final models.

OR = odds ratio; CI = confidence interval.

ns = non-significant.

might pursue transplant through donor-exchange for these 442 to 2222 intended recipients, we assumed that only half of the willing potential donors (32% willing for paired donation, 19% willing for list donation) would actually take action should they have these programs available (Figure 1). After using these willingness estimates to predict behavior, then an additional 141 to 711 more potential donors might donate their kidneys through paired donation every year. If this same group of ruled-out donors decided to donate through list donation instead, then 84 to 422 additional potential donors might donate through list donation yearly. In summary, if donor-exchange programs were available nationwide, then an additional 84–711 living donor transplants might be added to the approximately 6600 direct living kidney donations occurring yearly, which is a 1–11% increase.

Finally, these estimates are supported by clinical experience with paired donation. In its first year of operation, the Paired Donation Consortium increased living donor transplant rates in Ohio by 4% (E. Steve Woodle, personal communication, 11-15-2005).

Discussion

As policy makers and transplant centers consider developing national, regional and local donor-exchange and non-directed donation programs (8,20,30), understanding potential living donors' willingness to participate may help guide strategic decision-making. This study reveals that many incompatible potential donors are willing to participate in the programs and trust that their intended recipients will receive the benefits promised. This study also shows that a 1–11% increase in living donation rates may be possible through donor-exchange if half of all willing donors ultimately donated their kidneys.

Across the different donor-exchange programs, potential donors' willingness was based on how likely they thought it was that their intended recipient would receive a kidney. Potential donors were twice as willing to participate in paired donation compared to other programs, because paired donation ensured that both recipients would receive a kidney at the same time. Many potential donors also were willing to participate in list donation, particularly if their intended recipient received the next deceased donor kidney. However, like some transplant professionals and ethicists (5,20,31), some donors were concerned that participating in list donation might not benefit their intended recipient or might harm other patients waiting for deceased donor kidneys. These concerns represent a significant departure from other research which shows that patients generally trust the fairness of the allocation of deceased donor organs (32). However, since some patients were less willing to participate because of these concerns, patient education about how receiving a kidney influences the waiting time of others on the list and how they will get the right of first refusal of deceased donor kidneys in some programs is necessary for patients considering list donation.

Although most potential donors did not want to participate in non-directed donation as it would not benefit their intended recipients, it is still interesting that 12% of potential donors were extremely willing to donate to someone they do not know. It may be that empathetic potential donors who are not close family members of their intended recipients are volunteering because of their spiritual beliefs or other general motivations found to be true for non-directed donors (33). Since established non-directed donation guidelines require that the potential donor initiate the conversation about non-directed donation with a transplant center (7), transplant centers may generally want to make donors aware of non-directed programs and wait for interested donors to begin the discussion. Also, careful

psychological screening about the motivations and decision-making of all interested donors must still occur.

Potential donors' willingness to participate in donor-exchange also varied by their demographic characteristics. Close family members and spouses of their intended recipients, probably the group of potential donors most invested in their intended recipients receiving a transplant, were three times more willing to participate in paired donation when compared with other potential donors. For list donation, potential donors who had intended recipients on dialysis, particularly recipients new to dialysis, were four to five times more likely to participate compared to potential donors whose intended recipients were not yet on dialysis. Potential donors who are observing their intended recipients' stress adjusting to the physical, dietary and lifestyle stressors associated with dialysis might be more motivated to donate. Additional research is needed to determine why potential donors whose intended recipients are on dialysis and potential donors without a college degree are more interested in donor-exchange. Also, confirming previous research on the humanitarian motives of donors (24,34–36), we also found that potential donors were at least three times more willing to participate in donor-exchange or non-directed donation if they reported high levels of empathy for the plight of their intended recipients. Finally, although men and racial minorities are less likely to be living donors through direct donation (17,37), our preliminary work found that these individuals were equally willing to participate in donor-exchange compared to women or Caucasians.

There are many limitations to this study. Although this is a large sample of incompatible potential donors, we surveyed donors at only two transplant centers without access to donor-exchange or non-directed donation programs. Incompatible potential donors who have an active donor-exchange or non-directed donation program at their transplant center might have different levels of willingness for that particular program or for donor-exchange in general. Also, definitions of the donor-exchange and non-directed donation programs in this survey may not reflect exact characteristics of how specific regional or individual transplant center programs operate. Finally, we did not measure characteristics of the intended recipients, including their PRA, number of prior transplants and blood type that might affect their ability to be matched and could influence how many transplants result from donor-exchange.

With research on donor-exchange programs in its infancy, additional research is still needed to determine which benefits and concerns about donor-exchange and non-directed donation are most influential in guiding the decision-making of potential donors and how many potential donors want to travel to other centers to participate in paired donation. Also, since willingness does not always translate into action, additional research will need to be conducted in centers and regions with functioning paired donation and list

donation programs to determine how many purportedly willing potential donors actually participate and how many new living donor transplants result. We must also monitor their experiences throughout the transplant process to make sure that they were satisfied with the donation experience (38). Finally, as the surveyed potential donors were primarily Caucasian, the donor-exchange attitudes of racial minorities, particularly Hispanics and Asians, still need to be examined.

With the Breakthrough Collaborative revealing that deceased donor organ donation rates can increase by 10% in 1 year with a unified effort by transplant professionals (39), similar increases in living donation may also be possible if donor-exchange programs could be established nationwide. Although there are many logistical issues still to be overcome, this study revealed that patient interest in participating in these programs, particularly in paired donation, should not be one of the limiting factors to their success.

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Appendix 1: Donor-Exchange and Non-directed Donation Program Definitions

Type of program	Program definition
	The potential donor would donate to someone other than the intended recipient and the intended recipient would:
Paired donation	... receive a living donor kidney from another donor. In this program, a living donor would be found that matches his intended recipient and another recipient would be found that matches him. This could happen very quickly or could take many months or years. When the other donor and the recipient are found, the surgeries would take place at the same time so that both recipients would receive living donor kidneys.

List donation: Next available kidney	... receive the next available matching kidney from someone who has died from the deceased donor pool. It is important to remember that a matching kidney would have to be available and offered to the waiting list before the intended recipient could have a transplant and this could take weeks, months or might possibly never happen. However, by receiving the next kidney from someone who has died, the intended recipient's waiting time would be shortened.
List donation: Top 20% of waiting list	... be moved into the top 20% of the transplant waiting list for kidneys from people who have died. It is important to remember that a kidney from someone who has died would have to match the intended recipient before the intended recipient could have a transplant. This could take weeks, months or might possibly never happen. However, by being placed into the top 20% of the waiting list, the intended recipient's waiting time may be shortened.
Non-directed donation	... receive no direct benefits at all.

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