RESEARCH LETTER

Thirty-Year Trends in Perioperative Mortality Risk for Living Kidney Donors

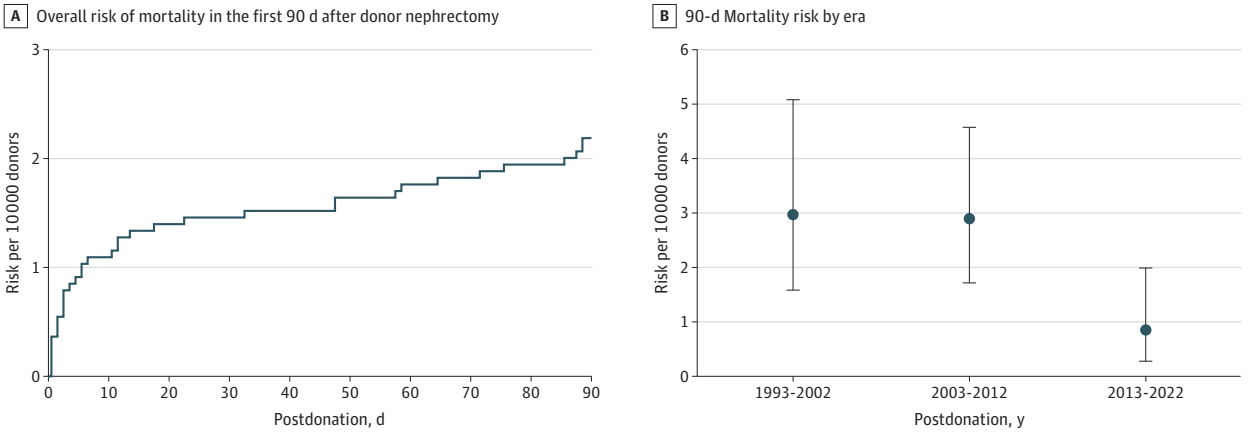
Living kidney donor candidates must be accurately informed of the risks of perioperative mortality. The best current estimate, 3.1 deaths within 90 days per 10 000 donations, comes from a study of donors from 1994 to 2009.[1] Open donor nephrectomy, standard of care in the 1990s, has now been replaced almost completely by laparoscopic nephrectomy.[2,3] Because of this transition, as well as improvements in donor selection, perioperative care, and surgical technique,[4] prior estimates of perioperative mortality may not accurately represent current risk to donors. We performed a national registry study to characterize temporal trends in perioperative mortality in donors and risk factors associated with this event.

Supplemental content

Methods | Using Scientific Registry of Transplant Recipients data on living kidney donors from 1993 to 2022, we calculated mortality ratios within 90 days of donation, stratified across 3 eras: 1993 through 2002, 2003 through 2012, and 2013 through 2022. Death events were captured from Organ Procurement and Transplantation Network (OPTN) living donor follow-up reported by transplant programs; National Technical Information Service Limited Access Death Master File; and deaths made available to the OPTN contractor through an interagency data sharing agreement between the Centers for Medicare & Medicaid Services and the Health Resources and Services Administration, and secondarily verified by the OPTN contractor. Per OPTN policy, all donor deaths within 2 years of donation must be reported within 72 hours of the hospital's becoming aware of the death. The institutional review board of NYU Langone Health determined that this study of deidentified data did not constitute human subjects research and waived consent. We compared mortality across eras and across subgroups of donors by age, sex, race, ethnicity, procedure type, body mass index (BMI; calculated as weight in kilograms divided by height in meters squared), and hypertension, using Fisher exact tests and reporting Clopper-Pearson exact CIs. Subgroups by procedure type and BMI category were analyzed during 1999-2022 and by history of hypertension during 2004-2022, when these variables were reliably captured in the registry. Owing to the small number of events, we did not conduct multivariable analyses. Analyses were conducted with Stata 17, using 2-sided tests with α = .05.

Results | There were 164 593 donors in our study, of whom 36 died within 90 days postdonation (2.2 per 10 000 cases); 50% of deaths occurred within the first 7 days (**Figure**, A). When cause-of-death data were available, the most common cause was hemorrhage (8 deaths of 19 with reported cause of death). Mortality was comparable in 1993-2002 (13 deaths, 3.0 [95% CI, 1.6-5.1] per 10 000) and 2003-2012 (18 deaths, 2.9 [95% CI, 1.7-4.6] per 10 000) and then declined statistically significantly in 2013-2022 (5 deaths, 0.9 [95% CI, 0.3-2.0] per 10 000; P = .01) (Figure, B). There were no statistically significant differences across subgroups of age, race, and ethnicity; compared with that of White donors (2.0 per 10 000), mortality was higher for Black donors (4.2 per 10 000) and lower among donors who were neither Black nor White (1.3 per 10 000; P = .12) (**Table**). Male donors were at higher risk than

Figure. Perioperative Mortality and Donor Nephrectomy



A, Eight individuals died due to hemorrhage; 2, due to infection; 2, due to pulmonary embolism; 2, due to cardiovascular causes; 1, due to cerebrovascular accident; 1, due to homicide; and 3, due to other reasons not specified.

B, Vertical lines denote 95% confidence bars. Cause-of-death information was available for 19 of the 28 deaths that occurred in 2000 or later.

Table. Donor Characteristics 1993-2022 and Risk of Mortality

	No. of donors	No. (per 10 000) who died within 90 d	*P* value
Overall	164 593	36 (2.2)	NA
Era			
1993-2002	43 752	13 (3)	.01
2003-2012	62 185	18 (2.9)	
2013-2022	58 656	5 (0.9)	
Age, y[a]			
≤40	74 421	14 (1.9)	.25
40-49	47 308	15 (3.2)	
≥50	58 656	7 (1.6)	
Sex[a]			
Male	64 703	26 (4)	<.001
Female	99 890	10 (1)	
Race[a]			
Black	19 011	8 (4.2)	.12
Other or multiracial[b]	22 994	3 (1.3)	
White	122 525	25 (2)	
Ethnicity (any race)[a]			
Hispanic/Latino	22 379	4 (1.8)	.81
Non-Hispanic/non-Latino	142 214	32 (2.3)	
Among donors 1999-2022			
Procedure type[a]			
Open	16 447	7 (4.3)	.08
Laparoscopic	124 771	24 (1.9)	
BMI category[a]			
Underweight or healthy weight	46 338	6 (1.3)	.59
Overweight	54 775	12 (2.2)	
Obese	32 417	6 (1.9)	
Among donors 2004-2022			
Predonation hypertension[a]			
No	106 967	15 (1.4)	.03
Yes	4006	3 (7.5)	

Abbreviations: BMI, body mass index (calculated as weight in kilograms divided by height in meters squared); NA, not applicable.

[a] Missingness is as follows: age, 7 donors; sex, 0; race, 63; ethnicity, 0; era, 0; procedure type (among donors 1999-2022), 2121; BMI (among donors 1999-2022), 9808; and predonation hypertension (among donors 2004-2022), 3399.

[b] Race and ethnicity were assessed to investigate whether risk of perioperative mortality differentially affects members of minority groups. Race and ethnicity were self-reported, with options defined by the Organ Procurement and Transplantation Network. The "other" category includes American Indian or Alaska Native, Asian, multiracial, Native Hawaiian or Other Pacific Islander, and unknown.

female donors (4.0 vs 1.0 per 10 000). Mortality was higher for donors who had open (vs laparoscopic) procedures, although not statistically significant (4.3 vs 1.9 per 10 000; $P = .08$). Mortality was consistent across categories of BMI. Mortality was higher for donors with a history of predonation hypertension (7.5 vs 1.4 per 10 000; $P = .03$).

Discussion | Perioperative mortality after living donation declined substantially in the past decade compared with prior decades, to fewer than 1 event per 10 000 donations. Risk was higher for male donors and donors with a history of hypertension. Current guidelines[5] for donor informed consent, based on 2009 data, should be updated to reflect this information.

Study limitations include that with only 36 perioperative deaths in 30 years, power to estimate relative risks is limited. Additionally, follow-up may be incomplete. However, OPTN requirements for donor follow-up have grown stricter, with 6-month follow-up required for donors since 2013; as such, missingness would bias toward lower mortality in earlier eras, the opposite of what the study found.

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Author Contributions: Drs Massie and Segev had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.
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Drafting of the manuscript: Massie, Levan.
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Data Sharing Statement: See the Supplement.

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