All-cause Hospitalization after nephrectomy Among Live Kidney Donors: Results from the WHOLE Donor Study

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WORD COUNT: 2603 (Limit 3000 [abstract+text])

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ABBREVIATIONS

95%CI– 95% confidence interval

CVD—cardiovascular disease

BMI— body mass index  
ESRD— end-stage renale disease

HR– hazard ratio  
ICD-10— international classification of disease, tenth revision

IQR– interquartile range

LKD– live kidney donor   
OPTN – Organ Procurement and Transplantation Network

SRTR– The Scientific Registry of Transplant Recipients

Hospitalization may be a sentinel event signaling risk for adverse outcomes including end stage renal disease and mortality among live kidney donors (LKDs). However, only two years of follow-up are mandated for LKDs preventing long term risk characterization in this population. To address this, we used a XX-year multicenter retrospective cohort study of LKDs with xxx years of follow up to identify factors associated with patient-reported all-cause hospitalization. Patient factors were captured from self-report and the SRTR. From among an entire cohort of xxxx, 2251 LKDs that donated between 05/1968-12/2019 responded to the survey. Overall, x (x%) reported any hospitalization a median (interquartile range) of xx (x-x) years post-nephrectomy with surgery/procedure as the most common cause (57%). The cumulative incidence of hospitalization was 5%, 34%, 50%, and 61% at 1 ,10, 15, and 20-years post-donation. In a parsimonious model, age at donation (aHR 1.011.131.27, p=0.04), female sex (aHR 1.071.391.80, p=0.01), and post-donation diabetes/hypertension (aHR 1.221.521.88, p<0.01) were associated with hospitalization. While self-reported, the frequency of hospitalization among LKDs beyond 2-years post-nephrectomy suggests longer follow-up may be warranted for this population. Furthermore, surveillance and follow-up should be emphasized in populations at higher risk of developing diabetes and hypertension after nephrectomy.

1. INTRODUCTION

More than 6,400 living kidney donors (LKD) underwent transplants in 2022, but the downstream health effects of living donation remain elusive.(1) Currently, the mandated follow-up time for LKD is two years, but the adverse outcomes, such as end-stage renal disease (ESRD), cardiovascular disease (CVD), and mortality, are likely to manifest much later. (2-6) Specifically, one study found that LKD were more likely to be diagnosed with ESRD more than ten years post-donation rather than earlier. (7) Furthermore, LKD have a 64% greater absolute risk of developing hypertension at 10 years post-donation compared to matched controls. (8, 9) Since the time to develop and detect these major outcomes is late, hospitalization may be a sentinel event that signals risk of adverse outcomes.

Currently, there are only two studies that reported on hospitalization. Therefore, this study aimed to assess the prevalence, causes, and risk factors of all-cause hospitalization following living kidney donation.

2. METHODS

**2.1 Data sources**

The current study uses data from the Wellness and Health Outcomes of Live Donors (WHOLE-Donor) project, a multicenter cohort study on donors who underwent live donor nephrectomy at Johns Hopkins, University of Maryland, University of Alabama, Medstar Georgetown, Virginia Commonwealth University, University of Illinois, or Northwestern University. Eligibility included live kidney donors who were ≥2 years post-donation. International or Non-English-speaking donors were excluded. From 01/2011 – 05/2022, a total of 6927 eligible donors were actively recruited using contact information provided by the transplant centers or LexisNexis Accurint. Donors completed a survey that evaluated the donor’s demographic, medical history, hospitalization, and quality of life. Surveys were distributed every 2 years after initial contact for a total of up to 5 surveys. Our study population included a subgroup (2251/6926 [33%]) of donors who consented and answered the survey question regarding hospitalization status. Additionally, donors consented for the WHOLE-Donor team to contact the donor’s medical provider for laboratory results and medical records.

WHOLE-Donor dataset was linked with the Scientific Registry of Transplant Recipients (SRTR) dataset, using date of donation, transplant center, sex, and age at donation, to augment the data with additional demographic and comorbidities. ￼Median household income was estimated using the 2021 American Community Survey dataset from the US Census Bureau () by matching census tract GEOID. (11) WHOLE-Donor dataset was also linked with an Area Deprivation Index (ADI), a publicly accessible and validated neighborhood socioeconomic disadvantage metric that combines 17 indicators, using the census block group GEOID. (12, 13) Participants provided informed consent. The Institutional Review Board approved this study (NA\_00044282 & NA\_00042871). www.census.gov) by matching census tract GEOID. (11) WHOLE-Donor dataset was also linked with an Area Deprivation Index (ADI), a publicly accessible and validated neighborhood socioeconomic disadvantage metric that combines 17 indicators, using the census block group GEOID. (12, 13) Participants provided informed consent. The Institutional Review Board approved this study (NA\_00044282 & NA\_00042871).

**2.2 Study population**

The source population included 6926 eligible donors, and our study population included 2251 (33%) donors who responded to the survey question about hospitalization status. The median (interquartile range [IQR]) time to survey was 11 (6-16) years post-donation. The 2251 donors who responded to the hospitalization survey were older, and more likely to be female, and Non-Hispanic White when compared to donors who did not respond to the hospitalization survey (Supplemental Table 1). Demographic, medical history, smoking history, and hospitalization status were collected via survey. Vital signs and laboratory results were collected via medical records from donor’s medical providers. Overall, 88% (n=1987) of our study population were identified in SRTR using these variables..

**2.3 Outcome of all-cause post-donation hospitalization**

The main outcome of all-cause post-donation hospitalization was defined as a positive response to the question, “Since your donation, have you been admitted to the hospital?” Among those who provided a positive response, the year, frequency, and cause for hospitalization were assessed (Supplemental Figure 1). The causes for hospitalization, which included self-reported free-text symptoms, diagnoses, surgeries or procedures, were classified by a single author (AC) using the International Classification of Disease, Tenth Revision (ICD-10) codes. The ICD-10 codes were then categorized into organ system/specialty (Supplemental Figure 2). Delivery (e.g. cesarian-section) was categorized separately from pregnancy-related hospitalization (e.g. ectopic pregnancy).

**2.4 Pre-donation factors associated with hospitalization**

Due to the exploratory nature of this project, we included a broad range of pre-donation factors in our analysis: age at donation, sex, race, education, smoking history, household income, area deprivation index, hypertension, vital signs (systolic and diastolic blood pressure, body mass index [BMI]), estimated glomerular filtration rate (eGFR). Less than 1% of our study population had pre-donation diabetes, so this was not included in the analysis. Age, body mass index (BMI), systolic and diastolic blood pressure, eGFR, and household income were included in the model as continuous variables. Race/Ethnicity categories of Hispanic ethnicity, Non-Hispanic White, Non-Hispanic Black, and Non-Hispanic Other races were captured using WHOLE-Donor surveys. (14) Due to the small proportion of LKDs who identified as Asian, Alaskan Native/American Indian, Multiracial or other, these categories were consolidated as Non-Hispanic Other. Our analyses used ADI as a binary variable; high ADI was defined as an ADI above the median of the study population. CKD-EPI creatinine equation 2021 was used to calculate the eGFR.

**2.5 Post-donation factors associated with hospitalization**

Post-donation diabetes and hypertension diagnosis and year of diagnosis were captured using WHOLE-Donor (Supplemental Figure 1) and SRTR data defined as a new diagnosis post-donation and before hospitalization. New self-reported diagnoses of diabetes or hypertension made after donation were treated as time-varying covariates.

**2.6 Statistical analysis**

We used a time-to-event framework to estimate hospitalization-free survival since donation. Patients were followed from the time of donation until the first self-reported year of hospitalization or survey completion date. Patients that reported hospitalization but did not report the year of hospitalization were excluded (n=72). We used multivariable Cox regression to identify pre- and post-donation time-varying risk factors associated with hospitalization. The final variables that were included in the model were selected based on Akaike’s Information Criteria. (15) To determine whether the role of ADI varied by donor race, we tested the interaction between race/ethnicity and ADI above/below the median in our study population. (16, 17) Missingness was handled using complete-case approach. To minimize overfitting, reduce the number of patients excluded for missing data, and understand the association between time-varying post-donation diagnoses and hospitalization, we ran an additional parsimoniously adjusted Cox regression model, including variables with missingness below x% (age at donation, sex, smoking history, and race/ethnicity). (18) All two-sided p-values <0.05 were considered statistically significant. Analysis was performed using Stata version 17.0/SE for Linux (StataCorp).

3. RESULTS

**3.1 Study population**

Our study included 2251 LKD who underwent live donor nephrectomy between 05/1968 and 12/2019. The median age at donation was 47(38-55) years; 1495 (66%) were female, and 1746(81%) were Non-Hispanic White. In terms of pre-donation medical history, few LKDs reported hypertension (6%) or diabetes (<1%). The median BMI was 27(24-30) kg/m2. Median systolic and diastolic blood pressure was 123(114-132) mmHg and 73(68-80) mmHg respectively. Median eGFR was 95(83-107) mL/min/1.73m2. In terms of social history, 93% had insurance at the time of donation, and 40% reported ever smoking tobacco. The median household income was $81,774(61,058-113,700) U.S. dollars. Most were college-educated (57%). The median ADI was 38 (20-60)% (Table 1).

**3.2 All-cause post-donation hospitalization** Over a median follow-up of 11(6-16) years, 938(42%) reported at least one hospitalization, with the first hospitalization reported at a median of 7(3-12) years post-donation. The median frequency of hospitalization was 1(1-2). Of the 938 LKDs, 895(95%) specified a cause for hospitalization, with 57% reporting that the hospitalization was related to a procedure or surgery of any specialty. When categorizing the causes by organ system/specialty, the most frequently reported causes were related to musculoskeletal (23%), followed by gastrointestinal (21%), cardiovascular (20%). Less frequently reported causes were female genitourinary (10%), neurologic (10%), urology/nephrology (7%), delivery/cesarean section (6%), hernia (5%), neoplasm (5%), endocrine (4%), breast (4%), ear, nose and throat (4%), respiratory (4%), and infectious disease (2%). The least frequently reported were psychiatric (1%), pregnancy (1%), hematology (1%), fall (1%), dermatology (1%), male genitourinary (1%), and post-operative complication (1%) (Table 2).

**3.3 Cumulative incidence of all-cause hospitalization**

In a time-to-event framework, the cumulative incidence of hospitalization at one, three, five, ten, fifteen, and twenty-years were 5% (95% confidence interval [CI]:4-5), 12% (95% CI:10-13), 18% (95% CI:16-20), 34%(95% CI:32-37), 50% (95% CI:47-53), and 61% (95% CI:58-65) respectively (Figure 1).

**3.4 Pre-donation factors associated with all-cause hospitalization**

Two pre-donation factors were statistically significantly associated with time to hospitalization: age (adjusted hazard ratio [aHR] 1.011.131.27, p=0.04) and female sex (aHR 1.071.391.80, p=0.01) (Figure 2). The following factors were not statistically significantly associated with all-cause hospitalization: hypertension history (aHR 0.651.011.59, p=0.96), BMI (aHR 0.991.121.27, p=0.06), systolic blood pressure (aHR 0.880.971.07, p=0.53), diastolic blood pressure (aHR 0.971.131.31, p=0.11), ever-smoke (aHR0.811.021.29, p=0.85), eGFR (aHR 0.991.071.15, p=0.08), Hispanic (aHR 0.601.172.30, p=0.64), Non-Hispanic Black (aHR 0.56­0.811.17, p=0.25), Non-Hispanic other (aHR 0.300.741.79, p=0.50), household income (aHR 0.930.971.00, p=0.10), not four-year college educated (aHR 0.770.971.22, p=0.79), insurance status (aHR 0.931.622.84, p=0.09), and high ADI (aHR 0.600.821.10, p=0.18). The role of ADI did not vary by donor race/ethnicity (p-interaction>0.24).

**3.5 Post-donation factors associated with hospitalization**

Overall, 3% of donors self-reported post-donation diagnoses of diabetes (0.7%) or hypertension (3%). In the Cox regression model adjusting for pre-donation factors, post-donation diagnoses were positively, but not statistically significantly, associated with hospitalization (aHR 0.901.301.88, p=0.16). In parsimonious model, post-donation diabetes or hypertension were associated with all-cause hospitalization (aHR 1.221.521.88, p<0.01). Donors included in the full model and the parsimonious model had similar demographic and clinical characteristics, with the exception of a longer follow-up time among those who had missing variables (15 vs 8 years between donation and last survey date) (Supplemental Figure 3 and 4).

4. DISCUSSION

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. First, Garg et al reported a 31 hospitalizations event per 1000 person years that was not statistically significantly compared a healthy control.(9) Second, Schold et al reported a 9% cumulative incidence of all-cause hospitalization among live donors at three-years post-donation nephrectomy. Additionally, they found that higher hospitaliation rates were associated with older age, African American race, depression, hypothyroidism, and longer initial hospitalization. (10) However, there are no studies on hospitalization beyond six years.

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In this multicenter cohort study of LKDs, xx% LKDs reported hospitalization for any reason by 15 years post-donation. The leading cause of hospitalization was reported as any surgery or procedure (57%). Age at donation and female sex were statistically significantly associated with hospitalization. In a parsimonious Cox regression model adjusted for xxx ,xx and xxx, post-donation diagnoses of diabetes or hypertension were associated with a 1.5-fold higher rate of all-cause hospitalization.

Our finding of cumulative incidence of 5% and 12% all-cause hospitalization at one and three-years post-donation is similar to that reported by Schold *et al.*(5% and 11% at one and three years post-donation) (10) While Schold et al had a larger study population and more granular dates of hospitalization, our study reported similar short-term cumulative incidences and was able to expand outcomes beyond three years post-donation. In this study, we found the cumulative incidences at five, ten, fifteen, and twenty-years to be approximately 18%, 34%, 50%, and 61% respectively. These findings are also in agreement with the report from the National Center for Health Statistics, which found that 5.8% and 7.8% among people aged 18-44 and 45-64, respectively, reported a hospital stay over the past year in 2018. (19) However, without adjusting for health characteristics, it is difficult to compare the rate of hospitalization to healthy living kidney donors.

We also found that older age at donation was associated with a 1.13 greater hazard of hospitalization, which was expected and consistent with reports from the general population .(20) Previous studies have shown that older donors have a reduction in nephron number and eGFR in the short term, but the risk of ESRD, cardiovascular disease, and mortality in the intermediate term is similar compared to healthy control or younger donors. (21-25) However, the insidious course of such adverse events may emerge beyond the respective study periods. Thus, hospitalization may be a surrogate measure of donor health status and remain an important risk to counsel older donors on, because hospitalization among older adults is associated with cognitive and functional impairments. (26-28) One study even reported a 122 greater hazard of any disability within five years after hospitalization among elderly patients who were not physically frail at baseline. (29)

Furthermore, we found that post-donation diagnoses of diabetes or hypertension was associated with a 1.5-fold higher rate of all-cause hospitalization. This is consistent with the work of Sanchez et al who reported that donors with post-donation hypertension had a greater hazard ratio of 1.77 and 1.55 of developing diabetes and proteinuria, respectively, compared to donors who never developed hypertension. (30) Since hypertension and diabetes are two of the leading causes of ESRD among live donors, this further highlights the need for vigilant follow-up and perhaps additional home blood pressure monitoring. (31)

A few limitations should be mentioned. First, the observational study design is prone to significant loss to follow-up, and the survey-measured outcomes lends to recall bias. Despite this, we are encouraged by the similarity in incidence of outcomes between this and other studies of living kidney donors. The use of ICD-10 codes for cause of hospitalization may be incomplete, and thus, we grouped causes by system, despite losing granularity. Data missingness, especially with the diagnoses of diabetes and hypertension, may depreciate the generalizability of our findings. However, our large study population and use of a multivariable regression adjusts for these variances. Lastly, the lack of a healthy non-donor control group makes comparison with the general population difficult. Though we found a report of similar one-year hospitalization incidence in the general population, there was no information on pre-existing health conditions that would have precluded kidney donation. Additionally, there are no data on hospitalization risk among healthy nondonors, so we cannot describe the nephrectomy-attributable rate of hospitalization, due to the challenges of finding an appropriate control group that has the same degree of highly selected health status and granular hospitalization data.

One of the strengths of this study is the long-term outcome with a median follow up of 11 (IQR 6-16) years between donation and last survey. Another strength of this study is the inclusion of social determinants of health, such as race and socioeconomic status, in our regression models. Though the interaction between race and neighborhood socioeconomic status was not statistically significant (p<0.24), Non-Hispanic Black race, Non-Hispanic other race, and disadvantaged neighborhood indexes were negatively associated with hospitalization, which may be related to structural barriers in access to healthcare, which has been well documented in the literature. (32)

In conclusion, older age at donation, female sex, and post-donation diagnoses of diabetes or hypertension were associated with greater risk of hospitalization after live kidney donation. Therefore, pre-donation counseling and post-donation vigilance should be emphasized.

ACKNOWLEDGMENTS

This work was supported by grant numbers T32GM136577 (MGB) from the National Institute of General Medical Sciences, T32DK007713 (JLA), 5K01DK114388-05 (MLL), K01DK101677 (ABM), K23DK129820 (FA) from the National Institute of Diabetes and Digestive and Kidney Diseases, K24AI144954-08 and 3U01AI138897-04S1 (DLS) from the National Institute of Allergy and Infectious Diseases, Johns Hopkins Catalyst Award (MLL), and Ben-Dov and Trokhan Patterson families.

The authors thank the participants of the Johns Hopkins Wellness and Health Outcomes of Live Donors (WHOLE-Donor) Study, without whom this research could not be possible. The WHOLE-Donor site principal investigators include Dr. Elizabeth A King (Johns Hopkins University), Drs. Jayme Locke and Rhiannon Reed (University of Alabama at Birmingham), Dr. Gaurav Gupta (Virginia Commonwealth University), Dr. Matthew Weir (University of Maryland), Drs. Matthew Cooper (Georgetown University), and Dr. John Friedewald (Northwestern University).

They also thank the members of the study team, including Sachin Mehta BA, Snigdha Panda BA, Ananda Thomas BA, Michael Irving BS, Samantha Getsin BS, Madeleine Waldram BS, Samantha Halpern BS, Austin Schmidt BA, Molly Ma BA, Jessica Semel BS, Rahul Daniel BS, Evan Lau BA, Angela Ramirez, and Faith Obilo. They also thank Diane Brown RN and Daniel S Warren PhD for project support and guidance.

DISCLOSURE

DL Segev received consulting fees from AstraZeneca, Novavax, Novartis, CareDx, Transmedics, CSL Behring, Jazz Pharmaceuticals, Veloxis, Mallinckrodt, and Thermo Fisher Scientific, lecture fees from Sanofi, AstraZeneca, Optum, CareDx, Novartis, and is a journal editor for Springer. ML Levan is a consultant for Takeda/Shire and Patients Like Me. The remaining authors of this manuscript have no financial disclosures or conflicts of interest to disclose.

The analyses described here are the responsibility of the authors alone and do not necessarily reflect the views or policies of the Department of Health and Human Services, nor does mention of trade names, commercial products or organizations imply endorsement by the U.S. Government. The data reported here have been supplied by the Hennepin Healthcare Research Institute (HHRI) as the contractor for the Scientific Registry of Transplant Recipients (SRTR). The interpretation and reporting of these data are the responsibility of the author(s) and in no way should be seen as an official policy of or interpretation by the SRTR or the U.S. Government.

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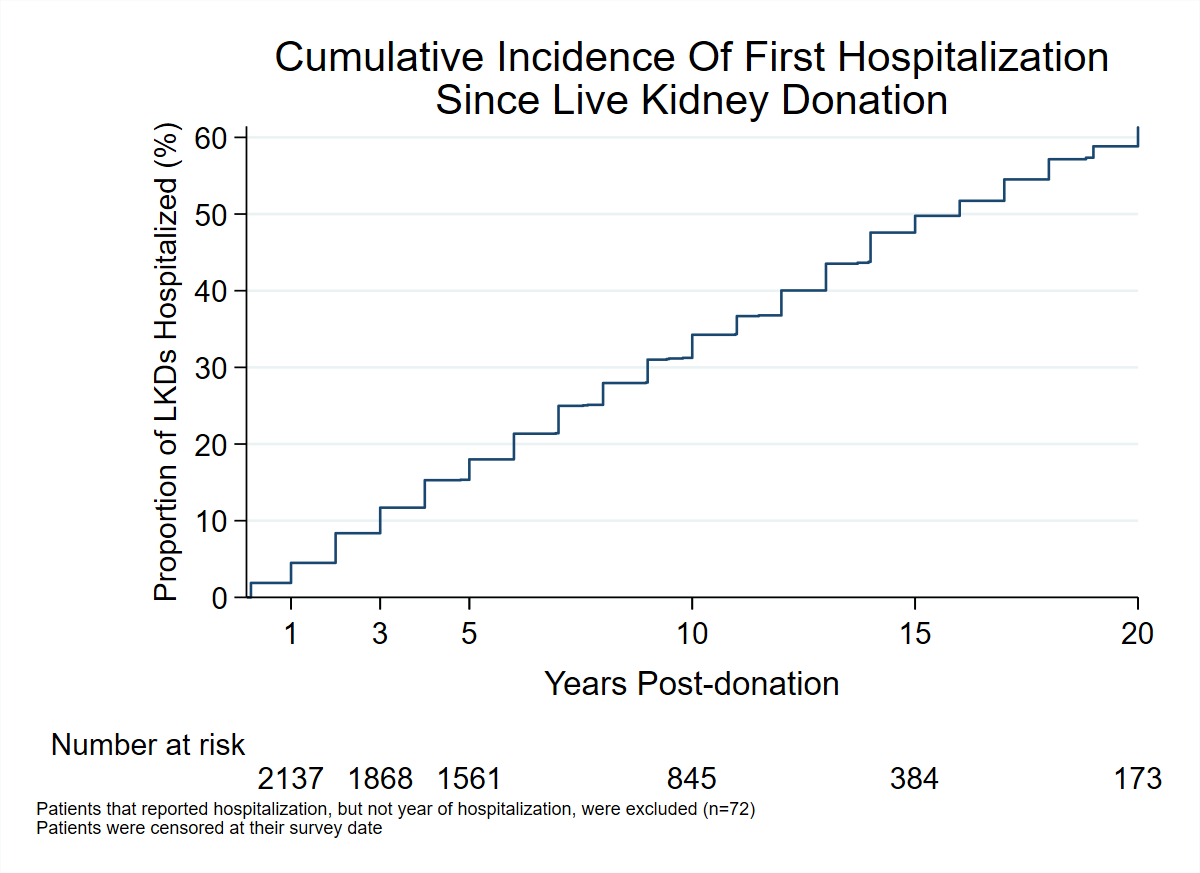
Table 1. Baseline demographic, health, and socioeconomic characteristics of live kidney donors among LKDs who were hospitalized versus never hospitalized.

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| --- | --- |
|  | N=2251 |
| Age, y, median (IQR) | 47 (38-55) |
| Female, % | 66 |
| Race/Ethnicity |  |
| Non-Hispanic White, % | 81 |
| Hispanic (any race), % | 3 |
| Non-Hispanic Black, % | 14 |
| Non-Hispanic Othera, % | 2 |
| Hypertension History, % | 6 |
| Diabetes History, % | <1 |
| BMI, kg/m2, median (IQR) | 27 (24-30) |
| Systolic BP, mmHg, median (IQR) | 124 (114-133) |
| Diastolic BP, mmHg, median (IQR) | 74 (68-80) |
| eGFR, mL/min/1.73m2,median (IQR) | 95 (83-107) |
| Ever Smokeb, % | 40 |
| Had Insurance, % | 93 |
| Four Year Bachelor or above, % | 57 |
| Household Income, USD, median (IQR) | 81774 (61058-113700) |
| Area Deprivation Index, %, median (IQR) | 38 (20-60) |
| Center, % |  |
| Johns Hopkins | 38 |
| University of Maryland | 22 |
| University of Alabama | 16 |
| Northwestern | 10 |
| Virginia Commonwealth | 7 |
| Medstar Georgetown | 7 |
| a Nonhispanic other includes Asian, Pacific Islander, American Indian, Alaskan Native, and other.  b Patient reported current or former smoker  BP: blood pressure | BMI: body mass index | IQR: interquartile range  Age <1% missing  Sex <1% missing  Race/ethnicity 4% missing  Hypertension history 23% missing  Diabetes history 24% missing  BMI 30% missing  Systolic blood pressure 35% missing  Diastolic blood pressure 35% missing  Serum creatinine/eGFR 24% missing  Ever Smoke <1% missing  Insurance status 5% missing  Education level <1% missing  Area deprivation index 19% missing  Transplant center 0% missing | |

Table 2. Cause for hospitalization by organ system/specialty

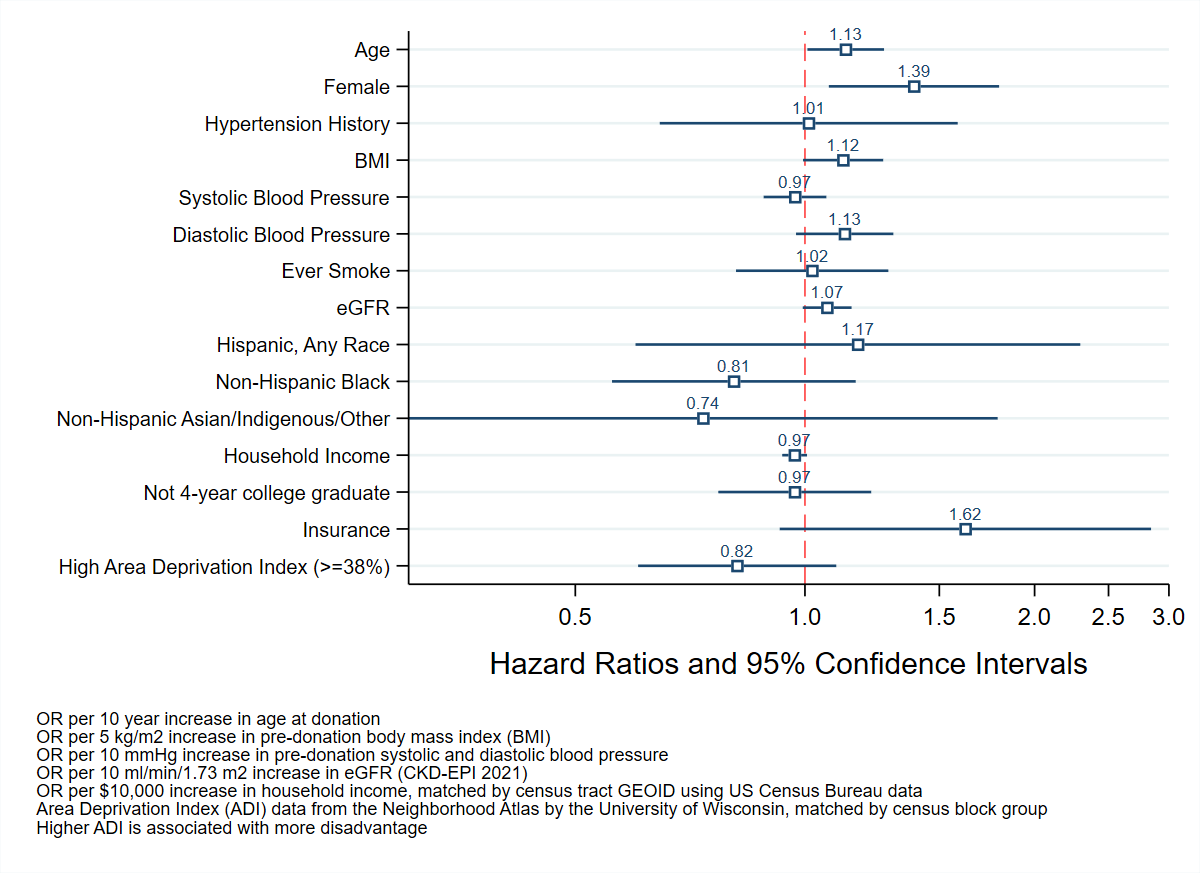
|  |  |
| --- | --- |
|  | N=938 |
| Years between donation and first hospitalization, median (IQR) | 7 (3-12) |
| Number of hospitalization post-donation, median (IQR) | 1 (1-2) |
| Hospitalization related to any surgery or procedure, % | 57 |
| Hospitalization related to organ system/specialtya, % |  |
| Musculoskeletal | 23 |
| Gastrointestinal | 21 |
| Cardiovascular | 20 |
| Female genitourinary | 10 |
| Neurology | 10 |
| Urology/nephrology | 7 |
| Hernia | 6 |
| Neoplasmb | 5 |
| Delivery/cesarean sectionc | 5 |
| Endocrine | 4 |
| Breast | 4 |
| Ear, nose, throat | 4 |
| Respiratory | 4 |
| Other | 4 |
| Infectious disease | 2 |
| Psychiatric | 1 |
| Pregnancyc | 1 |
| Hematology | 1 |
| Fall | 1 |
| Dermatology | 1 |
| Male genitourinary | 1 |
| Post-operative complication | 1 |
| a Cause for hospitalization includes symptoms, surgery, procedure, or diagnosis related to the respective system. These causes are mutually exclusive by organ system/specialty. b Neoplasm includes benign and malignant.  c Pregnancy and delivery/C section are mutually exclusive. | |

Figure 1: Cumulative incidence of first all-cause hospitalization+ post-donation among live kidney donors.



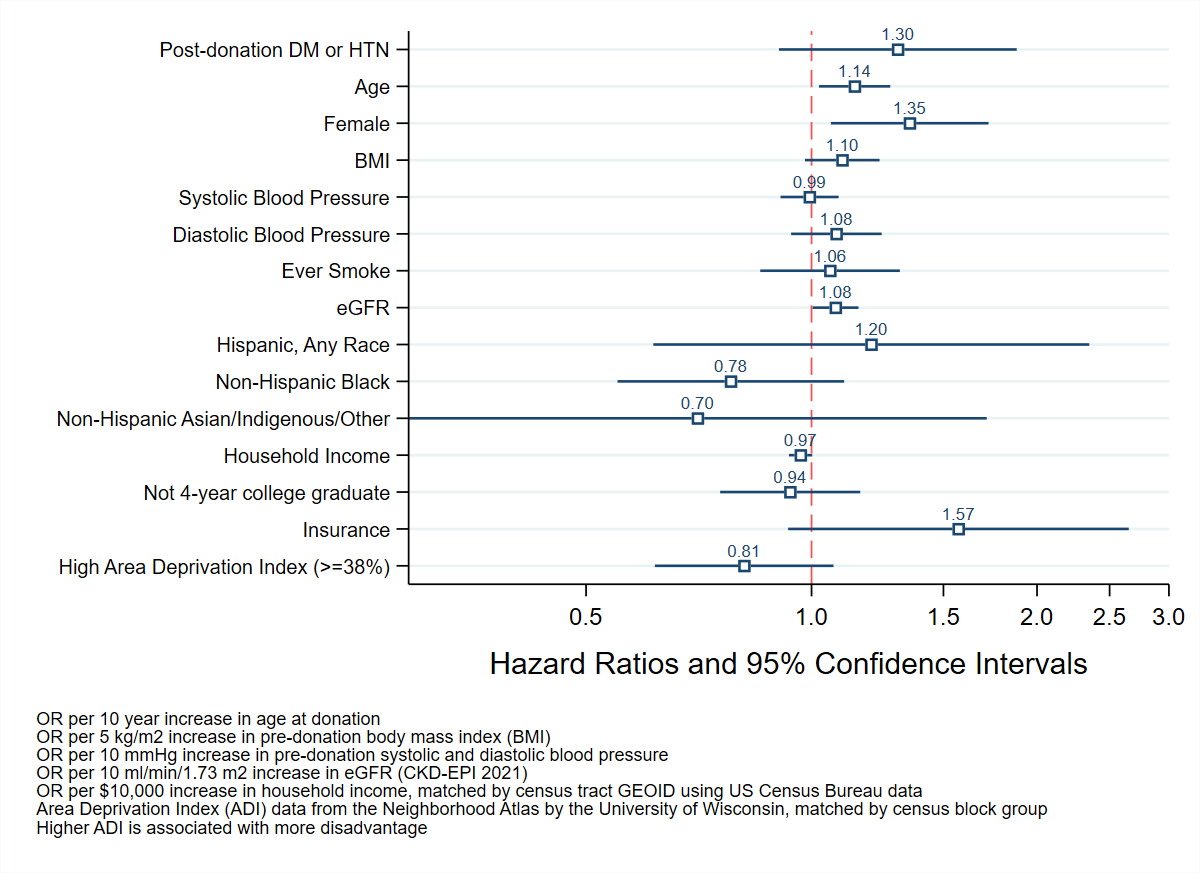
+Patient time-to-event calculated from the date of nephrectomy until the year of self-reported hospitalization or date of survey completion. Month and day of hospitalization were not reported. Thus, a patient was considered to have been hospitalized by 1-year post-donation if they reported hospitalization within a year post-donation.

Figure 2: Pre-donation characteristics associated with all-cause hospitalization after living kidney donation.



\*Patients that reported hospitalization but did not report the year of hospitalization were excluded (n=72). Patients were followed until the first self-reported hospitalization or survey date.

Figure 3: Pre- and post-donation characteristics associated with all-cause hospitalization.



Multivariable cox proportional hazard model was used to evaluate the association of post-donation diabetes or hypertension with hospitalization among live kidney donors, adjusting for baseline characteristics.

Supplementary Figure 1: Survey content

* Since your donation, have you been admitted to the hospital? *If yes, then the following questions would be asked.*
* How many times were admitted to the hospital? Please list the years when this happened, along with the reason for each admission. *Free text boxes would be available for participants to enter the year and reason for admission.*
* Please indicate whether a doctor or other health care professional has ever diagnosed or treated you for any of the following conditions after your kidney donation: (new conditions that you did not have before you donated your kidney)
  + Chronic/congestive heart failure
  + Coronary artery disease
  + Atherosclerosis
  + Heart attack
  + High blood cholesterol (hyperlipidemia)
  + High blood pressure (hypertension)
  + Stroke (cerebrovascular disease)
  + TIA (Transient ischemic attack)
  + Diabetes

Supplemental Table 1: Demographic and health characteristics of eligible donors who were contacted and completed a survey versus those who did not. Of the 6927 eligible donors, 2251 (33%) responded to the survey and answered the question “Since your donation, have you been admitted to the hospital?”.

|  |  |  |  |
| --- | --- | --- | --- |
| Factor | Survey Non-responders | Survey Responders | p-value |
| N | 4676 | 2251 |  |
| Age at donation, years, median (IQR) | 40 (32, 48) | 46 (38, 54) | <0.001 |
| Female, n (%) | 2515 (60) | 1320 (67) | <0.001 |
| Race, n (%) |  |  | <0.001 |
| Non-Hispanic White | 2881 (68) | 1593 (81) |  |
| Non-Hispanic Black | 1156 (27) | 294 (15) |  |
| Hispanic, any race | 82 (2) | 49 (2) |  |
| Non-Hispanic Indigenous/Asian/Other | 100 (2) | 31 (2) |  |
| Associates/Bachelor’s degree or above, n (%) | 459 (20) | 780 (40) | <0.001 |
| Hypertension, n (%) | 92 (4) | 105 (6) | <0.001 |
| Diabetes, n (%) | 4 (<1) | 5 (<1) | 0.35 |
| BMI, median (IQR), median (IQR) | 27 (24, 30) | 27 (24, 30) | 0.01 |
| Obese, n (%) | 727 (27) | 375 (24) | 0.04 |
| Ever smoke, n (%) | 751 (30) | 593 (30) | 0.92 |
| Serum creatinine, mg/dL, n (%), median (IQR) | 0.85 (0.7-1.0) | 0.8 (0.7-0.99) | <0.001 |
| CKD-EPI (2021), mL/min/1.73m2, median(IQR), median (IQR) | 99 (86, 111) | 95 (83, 107) | <0.001 |

Supplementary Table 2: ICD-10 classification of hospitalization

2375 causes were ascertained using ICD-10 codes.

Xxx to be filled out xxx

Supplemental Figure 2: Venn diagram of unique donors in the parsimonious versus full Cox regression model. \*Mutually exclusive

A picture containing text, screenshot, circle, font

Description automatically generated

Supplemental Figure 3: Comparing donor characteristic between missing variable versus not missing variable.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Missing variables | Not missing variables | p-value |
|  | n=1081 | n=1063 |  |
| Post-donation Diagnoses of DM or HTN, n (%) | 177 (16) | 155 (15) | 0.25 |
| Age at donation nephrectomy, years, median (IQR) | 45 (37, 53) (n=1081) | 48 (39, 56) (n=1063) | <0.001 |
| Female, n (%) | 699 (65) | 728 (68) | 0.061 |
| Race, n (%) |  |  | 0.64 |
| Non-Hispanic White | 869 (80) | 872 (82) |  |
| Hispanic, Any Race | 30 (3) | 31 (3) |  |
| Non-Hispanic Black | 159 (15) | 136 (13) |  |
| Non-Hispanic Other | 23 (2) | 24 (2) |  |
| Ever smoke, n (%) | 454 (42) | 384 (36) | 0.005 |
| BMI, kg/m2, median (IQR) | 27 (24, 30) (n=435) | 27 (24, 30) (n=1063) | 0.73 |
| Systolic BP, mmHg, median (IQR) | 123 (113, 133) (n=316) | 124 (114, 132) (n=1063) | 0.60 |
| Diastolic BP, mmHg, median (IQR) | 74 (68, 80) (n=316) | 73 (68, 80) (n=1063) | 0.81 |
| eGFR, median (IQR) | 96 (83, 109) (n=559) | 95 (83, 106) (n=1063) | 0.45 |
| Not 4 year college-educated | 503 (47) | 414 (39) | <0.001 |
| Have AT donation insurance | 968 (92) | 995 (94) | 0.23 |
| Disadvantaged Area Deprivation Index (>=38 Median) | 366 (54) | 511 (48) | 0.016 |
| Years between donation and last survey | 15 (8, 21) | 8 (6, 12) | <0.001 |

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There were a few statistically significantly different characteristics between LKDs who reported hospitalization versus those who did not. Most notably, LKDs who reported hospitalization were more likely to be female (69% vs 65%, p=0.03), diabetic (0% vs 1%, p=0.01), smoker (42% vs 38%, p=0.03), with a higher median BMI (27 vs 26 kg/m2, p=0.04). In terms of social history, they were also more likely to have a lower income ($79,099 vs $83,580, p<0.01), high ADI (54% vs 47%, p<0.01), yet less likely to be college-educated (53% vs 60%, p<0.01) (Table 2). Age, race/ethnicity, hypertension history, eGFR, systolic and diastolic blood pressure, and insurance status were not significantly different between the two groups.

|  |  |  |  |
| --- | --- | --- | --- |
| Table 2. Comparing baseline demographic, health, and socioeconomic characteristics of live kidney donors among LKDs who were hospitalized versus never hospitalized. | | | |
|  | Never Hospitalized n=1313 | Hospitalization n=938 | p valuea |
| Age, y, median (IQR) | 47 (38,55) | 47 (37,55) | 0.92 |
| Female, % | 65 | 69 | 0.03 |
| Race/Ethnicity |  |  | 0.07 |
| Nonhispanic White, % | 80 | 83 |  |
| Hispanic (any race), % | 3 | 2 |  |
| Nonhispanic Black, % | 14 | 14 |  |
| Nonhispanic Other, % | 3 | 2 |  |
| Hypertension History, % | 5 | 6 | 0.53 |
| Diabetes History, % | 0 | 1 | 0.01 |
| BMI, kg/m2, median (IQR) | 26 (24,30) | 27 (24-30) | 0.04 |
| Systolic BP, mmHg, median (IQR) | 123 (114,132) | 124 (114-133) | 0.43 |
| Diastolic BP, mmHg, median (IQR) | 73 (68,80) | 73 (68,80) | 0.31 |
| eGFR, mL/min/1.73m2, median (IQR) | 83 (69,102) | 85 (69,103) | 0.49 |
| Ever Smokeb, % | 38 | 42 | 0.03 |
| Had Insurance, % | 93 | 93 | 0.45 |
| Four Year Bachelor or above, % | 60 | 53 | <0.01 |
| Household Income, USD, median (IQR) | 83580 (62375- 117182) | 79099 (58899-108205) | <0.01 |
| Area Deprivation Index, %, median (IQR) | 35 (18-59) | 42 (22-62) | <0.01 |
| Area Deprivation Index ≥38%, % | 47 | 54 | <0.01 |
| a Categorical and continuous variables were analyzed using Pearson’s chi-square and Wilcoxon rank-sum (2 groups) test. Age <1 vs <1% missing  Sex <1 vs <1% missing  Race/ethnicity 4 vs 5% missing  Hypertension history 20 vs 28% missing  Diabetes history 20 vs 30% missing  BMI 23 vs 39% missing  Systolic blood pressure 29 vs 44% missing  Diastolic blood pressure 29 vs 44% missing  Serum creatinine/eGFR 20 vs 30% missing  Ever Smoke <1 vs <1% missing  Insurance status 4 vs 7% missing  Education level <1 vs <1% missing  Area deprivation index 20 vs 18% missing | | | |

Say something about socioeconomic and racial factors