The Effect of Psychiatric History on Pain and Related Outcomes Among Living Kidney Donors

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Abstract

Introduction: Living donor transplantation of kidneys accounts for one quarter of transplants performed in the United States. Careful screening of psychiatric history is a standard part of the donor evaluation. Little is known about the impact of psychiatric history on post-donation course and pain experience. Research Question: This study investigated whether psychiatric history was associated with pain and related outcomes among living kidney donors. Design: A retrospective medical record review was conducted of 75 living kidney donors who underwent laparoscopic donor nephrectomy. All donor candidates completed a psychological evaluation and were approved for donation by a multidisciplinary committee. History of psychiatric diagnosis and psychiatric medication use were obtained from donors’ psychological evaluation reports. Data on pain and related outcomes (ie, history of prescribed pain medication, post-donation pain, opioid use, length of hospital stay, post-donation emergency department visits), as well as demographic and donation-related characteristics were also abstracted from medical records. Results: Psychiatric history, including current or historical psychiatric diagnosis or psychiatric medication use, in living kidney donors who were evaluated and approved for donation by a transplant psychologist was not associated with greater perceived pain, greater use of opioid pain medication in the post-operative period, longer hospital stays, or more frequent post-donation emergency department visits. Discussion: The findings demonstrate that carefully screened donors with a psychiatric history have comparable pain-related outcomes as donors without a psychiatric history. This study highlights the importance of the pre-donation psychological evaluation in promoting positive postdonation outcomes through careful selection of donor candidates.

Keywords
living kidney donation, opioid use, pain, psychiatric history, psychological evaluation

Introduction

In 2017, living donor transplants accounted for over one quarter of kidney transplants performed in the United States.¹ Living kidney donors report favorable medical and psychosocial post-donation outcomes.²,³ A minority of living donors experience complications or are re-hospitalized 1 year after donation,¹ and rates of post-donation depression and anxiety are low.⁴ The majority of living kidney donors are satisfied with their decision to donate and indicate they would make the same decision to donate again.³ Moreover, living donors report perceived psychosocial benefits associated with donation, including improved self-esteem and increased happiness.⁵ The positive outcomes observed among donors may be attributable to the careful assessment and approval process for living kidney donation. Because living donation confers no direct physical benefit to the donor, donor candidates are

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thoroughly evaluated to minimize risk, with approximately 1/3 of prospective donors excluded for medical or psychosocial reasons. Although practices vary across transplant programs, psychosocial contraindications to donation may include substance abuse and significant psychiatric history. Evidence suggests that living donors with a history of significant psychiatric distress are at increased risk for adverse psychosocial outcomes, including post-donation mood disturbance and post-donation regret. Donors with a depressive disorder may also be at elevated risk for poorer medical outcomes, such as re-hospitalization and greater post-surgical pain.

Post-surgical pain is associated with indicators of delayed surgical recovery, including protracted hospital stay and greater number of emergency department visits in other surgical populations, suggesting that kidney donors with heightened post-surgical pain may also be at risk for poorer pain-related outcomes. Encouragingly, donors report low to moderate levels of pain in the days following the donation surgery and 20% of donors report no pain the day after surgery. By 5 days post-donation, approximately 90% of donors report no pain. Yet, a small portion (6%) of donors experience chronic pain related to donation more than 6 years after the donation surgery. Importantly, donors with chronic pain related to the donation surgery also report diminished quality of life. Minimizing risk for elevated donation-related pain is critical to promoting positive short and long-term psychosocial outcomes among living kidney donors.

While little is known about psychosocial predictors of post-surgical pain among living kidney donors, research suggests that certain psychiatric characteristics are related to pain outcomes among other surgical populations. For example, depressive and anxious symptoms are associated with higher levels of post-surgical pain among abdominal surgery patients. In addition, gallbladder surgery patients with depression requested more pain medication during hospitalization and history of depression has been associated with chronic opioid use in surgical patients. Thus, psychiatric history may be an important predictor of pain-related outcomes in living donors. The primary aim of the study was to evaluate the effect of psychiatric history on the following outcomes: 1) perceived pain, 2) opioid use, 3) length of hospital stay, and 4) post-donation emergency department visits.

**Methods**

**Design**

A retrospective chart review of living kidney donors who underwent laparoscopic donor nephrectomy at an academic health center between 2014 and 2017 was conducted. The start date was selected due to the availability of electronic medical records. The study was approved by the transplant center’s Institutional Review Board. No informed consent was required.

**Setting**

This study occurred at a Southern US academic health center between 2014 and 2017.

**Population**

Potential donors were evaluated for donation if they contacted the center to express interest in donating and were: 1) were ≥ 18 years of age and 2) self-reported good general health. Donor candidates underwent comprehensive medical and psychosocial evaluation and were reviewed by a multidisciplinary committee, which included physicians, surgeons, nurse coordinators, social workers, and psychologists, prior to being approved as donors. A report of all living donors from 2014 to 2017 was generated from electronic medical records.

**Sampling**

From 2014 to 2017, 108 laparoscopic donor nephrectomies were performed. Donors were excluded from analysis if their surgery took place prior to the implementation of the electronic medical record system (n=11), their medical record had missing pain ratings or psychiatric history information (n=21), or if their surgery was converted to an open nephrectomy (n=1).

**Data Collection**

The following data were abstracted from medical records. Medical record reviews were performed by licensed psychologists and psychology trainees. Data abstracted by trainees were verified for accuracy by psychologists.

**Demographic and pre-donation characteristics.** Demographic and pre-donation characteristics included age, gender, race, relationship to the transplant recipient, and use of prescription pain medication prior to the donation surgery.

**Psychiatric history.** All potential donor candidates completed a psychological evaluation conducted by licensed psychologists experienced in living donor evaluation and advanced psychology trainees. Psychological evaluations assessed multiple domains of psychosocial functioning and donation-related issues, including motivation for donation, social support, current stressors, current bodily pain and pain coping, lifetime substance use history, current psychiatric symptoms, lifetime psychiatric history, and coping style. Information on psychiatric history included in the psychological evaluation report was obtained by donor self-report and medical record review.

Donor candidates who presented with significant psychiatric histories which increased their risk for poor psychosocial outcome were ruled out for donation and subsequently provided appropriate mental health resources. Donor candidates who presented with less severe psychiatric histories and who were deemed to have adequate social support, good coping skills, and were adherent with psychiatric treatment recommendations were approved to proceed with donation and were included in this study.

For analysis, psychiatric history was recorded as present (yes) or absent (no). Donors were considered to have a psychiatric history if either of the following criteria were
Emergency department visits were recorded as documented in donors’ medical records and were included. Reported emergency department visits at other centers were for appropriate follow-up with the transplant center. Donor-emergency department visits to their donation coordinator and arranged care, if feasible. If not feasible, donors reported emergency to present to the transplant center’s institution for emergency department visits for trauma were excluded. Donors were instructed bleeding) were included in the analyses. Emergency department visits were assessed for relatedness to the day of discharge to 2 years following the donation surgery. Post-donation emergency department visits.

Average perceived pain. Nurses asked donors to rate their pain on a 0 (no pain) to 10 (worst imaginable pain) scale and documented these ratings in donors’ medical record. Perceived pain ratings were obtained at least once daily during the donors’ hospital stay. On average, 5.7 (SD = 2.0) pain ratings were documented for each donor per day of admission. To calculate an average pain score for analysis, the sum of all pain ratings was divided by the total number of pain ratings obtained over the hospital stay. Donors’ highest pain ratings were also recorded for descriptive purposes.

Opioid use. Quantity of opiate medication administered intravenously via patient controlled analgesia (PCA) pump or orally on each day of admission was converted into a daily morphine milligram equivalent (MME), an equivalency value commonly used to represent opiates’ relative potencies. The average number of MMEs used per day of admission was calculated for each donor. Higher MMEs indicate greater opioid use. The day that donors transitioned from intravenous pain medication to oral pain medication was also collected and was recorded as ≤ 3 days or > 3 days, according to the median number of days of intravenous pain medication use.

Length of stay. Length of hospital stay, inclusive of the day of the donation surgery, was categorized as ≤ 4 days or > 4 days, according to the median length of stay observed for this sample.

Post-donation emergency department visits. Data on post-donation emergency department visits were collected for donors from the day of discharge to 2 years following the donation surgery. Emergency department visits were assessed for relatedness to donation, and only visits with presenting problems determined to be potentially related to the donation (eg, abdominal pain, bleeding) were included in the analyses. Emergency department visits for trauma were excluded. Donors were instructed to present to the transplant center’s institution for emergency care, if feasible. If not feasible, donors reported emergency department visits to their donation coordinator and arranged for appropriate follow-up with the transplant center. Donor-reported emergency department visits at other centers were documented in donors’ medical records and were included. Emergency department visits were recorded as ≥ 1 visit or 0 visits for analysis.

Data Analysis

T-tests and chi-square analyses were performed to detect demographic and pre-donation differences among donors according to psychiatric history. Linear regression models were used to estimate the effect of psychiatric history on the following outcomes: 1) average perceived pain, and 2) average MMEs per day. Logistic regression models were used to estimate the effect of psychiatric history on the following outcomes: 1) length of intravenous pain medication use [≤ 3 days vs. > 3 days], 2) length of hospital stay [≤ 4 days vs. > 4 days], 3) and emergency department presentation [≥ 1 visit vs. 0 visits]). Demographic and pre-donation characteristics related to psychiatric history P < 0.20 according to t-tests and chi-square analyses were entered in the regression models as covariates. In addition, given the relationship between pain and other study outcomes observed in prior research, perceived pain was also included as a covariate in models predicting opioid use, length of hospital stay, and emergency department presentation.

Procedure

Donors in this study underwent standard evaluation, surgical, and follow-up procedures in accordance with our center’s protocol.

Results

Living Donor Characteristics

See Figure 1 for a flow diagram of donor process and study flow. Demographic, psychiatric, and donation-related characteristics are presented in Table 1. Donors (N = 75) had a mean age of 46.5 (SD = 11.3) years and were primarily female (54.7%) and White (73.3%). One fifth of all donors (21.3%) had at least 1 current (25%) or historical psychiatric (75%) diagnosis. In terms of psychiatric medication, 17.3% of all donors either had a history of taking psychiatric medication (7.7%) or were currently taking psychiatric medication (92.3%) at the time of psychological evaluation. Approximately one third of donors (n = 23, 30.7%) had either a history of psychiatric diagnosis or psychiatric medication use and were considered to have a positive psychiatric history. Among donors with a history of psychiatric diagnosis, 26.0% had a history of a substance use or addictive disorder (See Table 1 for a complete list of psychiatric diagnoses). Most donors donated to a first-degree relative (56.0%). The remaining donors were composed of extended family (14.7%), friends (10.7%), acquaintances/distant relationship (17.3%), and non-directed donors (1.3%). Most donors were not taking prescribed pain medication prior to donation (86.7%).

Psychiatric History Comparison

As shown in Table 1, donors with a psychiatric history did not differ from donors without a psychiatric history for age, gender,
race, or relationship to recipient. However, donors with a psychiatric history (26.1%) were significantly more likely to be taking prescribed pain medication prior to the donation surgery than donors without a psychiatric history (7.7%), $P = 0.03$.

**Perceived Pain**

The mean highest pain rating reported by donors during their hospital stay was 7.5 ($SD = 1.7$) reflecting moderately high pain. Half of donors (53.3%) reported their highest pain rating on the day of the donation surgery, while 28.0% of donors reported their highest pain rating on the first post-operative day. Donors described low to moderate pain ($M = 3.6$, $SD = 1.3$) averaged across the hospital stay. Highest perceived pain rating and average perceived pain rating across hospital stay were moderately correlated, $r (75) = 0.64$, $P < 0.01$. As shown in Table 2, psychiatric history did not predict average perceived pain, adjusting for relationship to recipient and pre-donation pain medication use.

**Opioid Use**

Nearly all (98.7%) of donors used a PCA pump for at least 1 day during their admission ($M_{days} = 3.0$, $SD = 0.6$, range: 2.0 – 5.0). Figure 2 displays the percentage of donors using a PCA pump, as well as average MME use on each day of admission. Donors required an average of 60.1 ($SD = 24.2$) MMEs per day during the entire hospital stay. Collectively, average perceived pain, relationship to recipient, pre-donation pain medication use, and psychiatric history explained 31% of the variance in average MMEs per day of admission. While psychiatric history did not emerge as an independent predictor, greater perceived pain was associated with increased MMEs per day ($\beta = 0.56$, $P < 0.01$, 95% CI [0.36, 0.76]) (see Table 2).
Most donors (84.0%) spent 2-3 days on intravenous pain medication before transitioning to oral pain medication. As illustrated in Table 3, average perceived pain, relationship to recipient, pre-donation pain medication use, and psychiatric history jointly predicted length of intravenous pain medication use. While average perceived pain independently predicted longer (> 3 days) use of intravenous pain medication (OR = 2.29, P = 0.01, 95% CI [1.19, 4.41]), psychiatric history was not associated with length of intravenous pain medication use.
Most donors (64.0%) were admitted to the hospital for 4 or fewer days. According to medical record review, pain was indicated as a factor contributing to an extended stay for 38% of donors hospitalized more than 4 days. Average perceived pain, relationship to recipient, pre-donation pain medication use, and psychiatric history did not predict longer (> 4 days) hospital stay (see Table 3).

**Table 3.** Logistic Regression Models Estimating the Effect of Psychiatric History on Pain-Related Outcomes.

<table>
<thead>
<tr>
<th></th>
<th>OR</th>
<th>95% CI</th>
<th>P</th>
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<tbody>
<tr>
<td><strong>Length of intravenous pain medication use</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average perceived pain</td>
<td>2.29</td>
<td>1.19, 4.41</td>
<td>0.01</td>
</tr>
<tr>
<td>Relationship to recipient</td>
<td>0.49</td>
<td>0.11, 2.25</td>
<td>0.36</td>
</tr>
<tr>
<td>Pre-donation pain medication use</td>
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<td>0.03, 3.16</td>
<td>0.31</td>
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<tr>
<td>Psychiatric history</td>
<td>2.98</td>
<td>0.66, 13.40</td>
<td>0.15</td>
</tr>
<tr>
<td><strong>Model</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length of stay</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average perceived pain</td>
<td>1.47</td>
<td>0.98, 2.20</td>
<td>0.07</td>
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<tr>
<td>Relationship to recipient</td>
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<td>0.15, 1.27</td>
<td>0.13</td>
</tr>
<tr>
<td>Pre-donation pain medication use</td>
<td>1.79</td>
<td>0.42, 7.65</td>
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<td>Psychiatric history</td>
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<td>0.62</td>
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<tr>
<td><strong>Model</strong></td>
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<tr>
<td>Emergency department visit</td>
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<td></td>
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<tr>
<td>Average perceived pain</td>
<td>1.70</td>
<td>0.86, 3.34</td>
<td>0.13</td>
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<td>Relationship to recipient</td>
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<tr>
<td>Pre-donation pain medication use</td>
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<td>0.22, 10.09</td>
<td>0.68</td>
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<tr>
<td>Psychiatric history</td>
<td>2.50</td>
<td>0.48, 12.86</td>
<td>0.27</td>
</tr>
<tr>
<td><strong>Model</strong></td>
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*First-degree relative is the reference category.

*bNo pre-donation pain medication use is the reference category.

*cNo psychiatric history is the reference category.

![Figure 2](image.png)

**Figure 2.** Percentage of donors using a PCA pump and mean opioid use (MMEs) by day of admission. PCA indicate patient-controlled analgesia, MME, morphine milligram equivalent.

**Length of Hospital Stay**

Most donors (64.0%) were admitted to the hospital for 4 or fewer days. According to medical record review, pain was indicated as a factor contributing to an extended stay for 38% of donors hospitalized more than 4 days. Average perceived pain, relationship to recipient, pre-donation pain medication use, and psychiatric history did not predict longer (> 4 days) hospital stay (see Table 3).

**Emergency Department Visits**

Most donors (89.3%) did not present to the emergency department within 2 years of discharge following the donation surgery. Six donors (8.1%) had 1 emergency department visit, and 2 donors (2.7%) visited the emergency department more than once. Average perceived pain, relationship to recipient, pre-donation pain medication use, and psychiatric history did not predict presentation to the emergency department within 2 years of discharge (see Table 3).
Discussion

The present study examined the effect of pre-donation psychiatric history on post-donation pain and related outcomes in small sample of living kidney donors at single transplant center. The primary finding was that psychiatric history, including psychiatric diagnosis and use of psychiatric medication, in donors evaluated and approved for donation by a psychologist was not associated with higher pain ratings, greater use of pain medication in the post-operative period, longer hospital stays post-donation, or more post-donation emergency department visits. These findings imply that the presence of a psychiatric history does not negatively impact the donor in the post-donation period and indicate that donors who have a psychiatric history, but who are carefully screened by a transplant psychologist, are not at higher risk for elevated donation-related pain. The findings also highlight the importance of the pre-donation psychological evaluation in promoting positive post-donation outcomes through careful selection of donor candidates.

In general, donors demonstrated satisfactory pain-related outcomes, with a minority of donors presenting to the emergency department following donation (11%) and observed length of hospital stay consistent with other studies of living kidney donors. While donors in the current study reported higher early post-donation perceived pain compared to other studies of living kidney donors, the considerable difference between highest ($M = 7.5$) and average pain rating across the hospital stay ($M = 3.6$) suggests that elevated pain was transient.

Given that only donors who were approved for kidney donation by a multidisciplinary committee were included, it may be that even though these donors had current or historical psychiatric diagnoses, they were functioning well at the time of the donation surgery. Although 31% of the patients in the current study met criteria for a psychiatric diagnosis or were taking psychiatric medication, they may not have been struggling with psychiatric symptoms to the same degree as the candidates who were not approved for donor surgery. In addition, donors may have been impacted by the psychosocial benefits associated with their altruistic act of donation, such as improved self-esteem and increased happiness, and those benefits may have been protective against pain perception and other pain-related issues post-donation.

The present finding that psychiatric functioning was not related to post-donation pain is consistent with other research suggesting that trait anxiety is not associated with post-donation pain among living liver donors. However, the finding that donors with a psychiatric history did not report elevated post-donation pain contrasts with other research suggesting that living liver donors who report better pre-donation mental health experience lower post-donation pain. It is possible that donors affected by long-term chronic pain experience reduced quality of life and impaired psychosocial functioning, while psychiatric history prior to donation is not related to the acute post-surgical pain experienced by many donors. Our findings also contrast with research indicating that depressive and anxious symptoms were associated with higher levels of postsurgical pain and use of pain medication among abdominal surgery patients, as well as higher rates of readmission. Abdominal surgery patients undergoing procedures with direct personal benefit may not be subject to the same rigorous psychological evaluation as living kidney donors. This finding may also be explained by use of psychiatric diagnosis according to the DSM-5, while other research has found relationships between non-clinical levels of distress and post-operative pain. An alternative explanation may be that rather than only depression and anxiety, our study involved donors with a variety of psychiatric diagnoses and the impact of the symptoms of these varied psychiatric diagnoses on post-donation pain was diluted. Other research has found that psychiatric history collapsed across a broad range of diagnoses (eg, bipolar disorder, anxiety, posttraumatic stress disorder, depression) adversely impacts physical and mental health-related quality of life after kidney donation, suggesting that history of any psychiatric distress may be an important predictor of post-donation outcomes.

Limitations

While this study is one of few reports that consider the relationships between psychiatric functioning and post-donation pain among kidney donors, the findings must be interpreted in the context of the following limitations. First, the sample of living donors ($N = 75$), and subset of donors with a psychiatric history ($n = 23$), may not have been sufficient to detect significant differences between donors with and without a psychiatric history. However, it is notable that the confidence intervals for the unstandardized effects of psychiatric history on average perceived pain (95% CI [-0.74, 0.63]) and MME use (95% CI [-10.15, 11.34]) are contained within the pooled standard deviations for these outcomes ($SD_{pain} = 1.3$; $SD_{MME} = 24.2$), indicating that donors with and without a psychiatric history were clinically comparable for perceived pain and MME use. Second, pain or psychiatric history information was missing from the medical records of 21 donors, potentially limiting the generalizability of the findings. Next, a minority of donors report chronic post-donation pain, and the design of our study precluded us from examining the effect of psychiatric history on pain in the years after donation. Another limitation was that we included both current and history of psychiatric disorder and psychiatric medication use in our group of donors with a positive psychiatric history. Although this prevented us from describing donors’ precise psychological state at the time of donation, it is inclusive of psychiatric disorders that were episodic in nature (eg, major depressive disorder). We also did not assess psychological functioning following donation, and therefore did not capture potential relapses or exacerbations of psychiatric distress in the post-donation period. However, no donors were referred to psychology during routine follow-up care with the transplant medical team, as required by our center’s protocol. Donor candidates may have been motivated to present themselves favorably during the pre-donation
psychological evaluation and may have underrepresented their psychiatric history. However, all pre-donation psychological evaluations were conducted by licensed psychologists with expertise in transplantation and organ donation. Finally, although we considered psychiatric medication use as an indicator of psychiatric history for a small number of donors without a documented psychiatric diagnosis, these medications may have been prescribed for non-psychiatric purposes.

Future Directions

Future research should enhance the generalizability of this preliminary work by studying the pain experiences of kidney donors at more than 1 transplant center. Furthermore, future research should identify potential differences in pain-related outcomes according to psychiatric diagnostic category, which may help refine donor evaluation and selection. In addition, future research should include individuals who were not approved for kidney donation to determine if they experience long-term effects from the experience of being denied the opportunity to donate.

This research provides valuable information that has the potential to inform donor evaluations and selection if these findings were to be replicated with larger samples of donors. For example, psychological harm is possible when donor candidates are denied the opportunity to donate to recipients with whom they have a close relationship.26 Donor candidates with a psychiatric history may particularly vulnerable to distress associated with denial as a donor, and therefore research indicating satisfactory outcomes among donors with psychiatric histories may provide aid in the living donor evaluation and selection process.

Conclusion

Kidney donors with a psychiatric history who underwent a pre-donation psychological evaluation and were approved to donate appear to have similar pain-related outcomes relative to donors with no psychiatric history. This finding implies that psychiatric history independently may not confer additional risk on living kidney donors, while underscoring the importance of the pre-donation psychological evaluation in determining candidacy for living kidney donation.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

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