Post-Traumatic Stress Disorder and Post-Traumatic Growth following Kidney Transplantation

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Key Points

- Although kidney transplantation can increase risk for post-traumatic stress disorder, many recipients experience psychologic growth in response to the same stressors.
- Underlying characteristics such as resilience affect how recipients respond to kidney failure and transplantation.
- Investigators are just starting to understand the role of psychologic stress during kidney failure and transplantation.

Abstract

Background Kidney transplantation (KT) is a life-saving therapy for kidney failure. However, KT recipients can suffer from debilitating depression, post-traumatic stress disorder (PTSD), and suicide. In contrast to PTSD, post-traumatic growth (PTG) is a positive psychologic change in response to a challenging situation. PTG has been studied in other chronic diseases, but less is known about its role in the setting of KT. We sought to elucidate the prevalence, predictors, and the effect of PTSD and PTG on post-KT outcomes. We also considered the roles of benefit finding and resilience.

Methods In a literature review, we identified publications that examined PTSD, PTG, benefit finding, and/or resilience in KT recipients. We excluded case reports and first-person narratives. Publications meeting the specified criteria after full text review underwent data abstraction and descriptive analysis.

Results Of the 1013 unique citations identified, 39 publications met our criteria. PTSD was the most common construct evaluated (16 publications). Resilience was studied in 11 publications, PTG in nine, and benefit finding in five. Up to 21% of adult and 42% of pediatric KT recipients may experience PTSD, which is associated with lower quality of life (QOL), impaired sleep, and other psychiatric comorbidity. PTG was associated with improved QOL, kidney function, and reduced risk of organ rejection. Although benefit finding tended to increase post KT, resilience remained stable post KT. Like PTG, resilience was associated with lower psychologic distress and increased treatment adherence and confidence in the health care team.

Conclusions PTG, resilience, and benefit finding appear to reduce the risk of PTSD, promote well-being, and reduce risk of graft failure in KT recipients. Future research to understand these relationships better will allow clinicians and researchers to develop interventions to promote PTG, resilience, and benefit finding, and potentially improve post-transplant outcomes such as adherence and reducing risk of organ rejection.

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Introduction

Kidney transplantation (KT) is a life-altering event typically after years of living with kidney disease. With advances in medical care, 78% of KT recipients will now survive for ten or more years (1). Quality of life (QOL) and functional performance both improve after KT, with recipients of living donor KT (LDKT) experiencing greater benefit compared with recipients of deceased donor KT (DDKT) due in part to their reduced exposure to dialysis (2). However, kidney disease, dialysis, years spent on the KT waitlist, KT surgery, and post-KT recovery can be highly stressful. KT recipients face the constant risk of graft failure, return to dialysis, and death (3). Recipients’ responses to these stressors range from impressive psychologic growth to debilitating major depressive disorder (MDD), post-traumatic stress disorder (PTSD), and suicide (4–6). Transplantation has been alternately described as a “scheduled trauma” (7) and “gift of life” (3).

Due to the complicated reality in which KT recipients live (8), much effort has been devoted to exploring the role and effect of depression and coping after KT. Only recently have investigators considered the role of PTSD and its counterexample, post-traumatic growth (PTG), in transplant recipients.

Although PTSD is a negative reaction (e.g., intrusive/negative thoughts, avoidance, negative mood, and increased arousal) to an actual or perceived severe threat, injury, or violence (9), PTG is defined as a positive psychologic change in response to an extremely challenging life situation (10). PTG parallels other concepts such as benefit finding, stress-related growth, and meaning making (11); certain coping approaches such as positive reframing and positive reappraisal are often described in similar terms. Resilience is often thought to affect the likelihood an individual will undergo PTG or benefit finding (12). See Table 1 for an overview of PTSD, PTG, benefit finding, and resilience.

In this literature review, we sought to elucidate the prevalence of PTSD and PTG after KT, predictors of PTSD and PTG post KT, and the effect of both on post-KT outcomes. We also considered the role of benefit finding and resilience after KT.

Materials and Methods

We conducted a review of the literature based upon guidelines established by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement (13), followed by a descriptive analysis of the publications found to meet our review criteria.

Search Strategy

The medical librarian (J.L.) searched PubMed, Embase via Elsevier, PsycInfo via EBSCO, and Scopus from their dates of inception to the final search date of September 16, 2021. The librarian used subject headings and keywords for kidney transplantation and PTSD/PTG concepts and an English language filter. See Supplemental Methods for the full list of the search terms.

Inclusion criteria included: (1) Instudy of PTSD, PTG, benefit finding, and/or resilience in (2) KT recipients of all ages, and (3) available as full text in the English language.

Exclusion criteria included: (1) case reports (n=2), (2) first-person narratives, and (3) dissertations.

Literature Review

All abstracts and titles were initially examined by two independent reviewers (R.N., E.B., T.R., J.S., M.L., and A.H.). The full texts of publications that met our criteria were then evaluated by two independent reviewers (R.N., E.B., T.R., J.S., M.L., and A.H.). During both steps, conflicts were resolved by a third reviewer or the majority of reviewers until consensus was reached.

All publications meeting the defined criteria after full text review underwent data abstraction. Data abstracted from the full text included publication type, journal, study location, primary construct(s), and psychologic measures utilized.

To identify any additional relevant citations, we compared the references cited by included reviews to the list of citations generated by the literature search. Additional references were reviewed and included in the data abstraction step if they met our review criteria.

Results

Search Results

The search yielded a total of 1892 citations. Figure 1 depicts the flow of article selection. After the removal of 879 duplicates, 1013 unique citations remained. The initial title/abstract review reduced the total number to 303 citations, and the full text review resulted in 38 publications for analysis. After reviewing citations of included reviews and examining the full text of three additional publications (bringing final number of unique citations evaluated to 1016), we included one additional publication. In total, we abstracted data from 39 publications.

Publication Characteristics

The 39 publications meeting inclusion criteria were published in 28 different peer-reviewed journals in 18 different countries and occurred in a variety of settings (e.g., clinic, hospital, community). The majority collected cross-sectional data from KT recipients; three were interventional studies, and three collected longitudinal data prior to and after KT. Due to the limited number of randomized controlled trials (RCTs; n=2), our data analyses were primarily descriptive in nature because the publications were not amendable to analysis by traditional meta-analytical techniques or other standardized quality assessment tools. Of the four constructs studied, PTSD was the most common (16 publications). Resilience was studied in 11 publications, PTG in nine, and benefit finding in five. Some publications studied more than one construct. Ten of the publications included children or adolescents. Nine publications also included heart, lung, and/or liver transplant recipients. Data abstraction and descriptive analyses focused on data pertinent to KT recipients. Table 2 summarizes publication characteristics.

Post-Traumatic Stress Disorder

We identified 16 publications that studied PTSD after KT (4,5,7,14–26). Six included pediatric populations (7,18–20,
Table 1. Overview of PTSD, PTG, benefit finding, and resilience

| Category                        | Definition                                                                 | Representative Instruments                                                                 |
|---------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
| Post-traumatic stress disorder  | An actual or perceived severe threat, injury, or violence to self, close family, or close friend leading to (1) intrusive symptoms (e.g., nightmares, flashbacks) (2) avoidance of stimuli associated with the event (3) negative alterations in mood/cognition, and (4) marked alterations in arousal (e.g., severe startle reflex), with symptoms lasting ≥1 month (9) | PTSD Checklist for DSM-5 (PCL-5)—updated to reflect DSM-5 criteria (55) PTSD Checklist—Civilian Version (PCL-C) (56) Davidson Trauma Scale (57) Impact of Events Scale—Revised—notably does not directly screen for alterations in mood (58) |
| Post-traumatic growth           | A positive psychologic change (in self-perception, relationship, and/or life philosophy) in response to an extremely challenging life situation (10) | Post-Traumatic Growth Inventory (53)—measures five factors: relating to others, new possibilities, personal strength, spiritual change, and appreciation of life; developed to measure positive change in response to traumatic events and track this growth over time |
| Resilience                      | The ability to adapt well to stress, trauma, tragedy, or threats; to bounce back from difficult experiences and to overcome adversity (59) | Connor–Davidson Resiliency Scale (60)—abbreviated versions also available Resilience Scale (61) |
| Benefit finding                 | The identification of positive psychologic changes after a negative life event (11) | Dutch Illness Cognition Questionnaire, disease benefits subscale (54) Ryff’s Psychologic Well-Being Assessment, Personal Growth subscale (62) |

25,26). There were four literature reviews (5,7,23,25) and two retrospective chart reviews (17,18). Six studies collected cross-sectional data from KT recipients (4,16,19,20,22,26), two studies collected longitudinal data from KT candidates and recipients of living related donor organs (14,24), one study collected longitudinal data from KT recipients (15), and one described an RCT of expressive writing (21). Outside of reviews, the studies included 5545 KT recipients, 4509 of whom were described by retrospective chart reviews. A range of instruments and structured interview techniques were used to screen for PTSD symptoms and/or establish a PTSD diagnosis (Supplemental Table S1, Table 3).

Prevalence of PTSD after KT varied widely, depending on the diagnostic tool or screening method used and the time since KT. In adults, prevalence ranged from 0.4% in recipients of LRKT 3 months post KT (14) to 21% in recipients of primarily DDKTs 3–6 months post KT (4). Among adults, KT recipients reported more frequent (P=0.002) and intense (P<0.001) PTSD symptoms than dialysis patients (16). Prior exposure to trauma (r=0.39, P≤0.01) (4), higher educational attainment (r=0.27, P≤0.05) (4), and reports of suffering/distress resulting from dialysis (β=0.32, P=0.03) (15) were the only identified risk factors for PTSD symptoms post KT. Across other solid-organ transplant groups, potential risk factors including younger age, being a woman, lower educational status, pretransplant psychiatric disorder, retransplantation, postoperative complications, acute rejection, longer intensive care unit stay, poor social support, post-transplant depression, and low resilience have been suggested (5). PTSD was associated with impaired sleep (P<0.001) (16) and lower QOL in adult KT recipients (PTSD severity accounted for 15% of QOL variance; P=0.001) (4). If a KT candidate was diagnosed with PTSD prior to evaluation and transplantation, there was no evidence that this PTSD diagnosis increased the risk for death, graft loss, or medication nonadherence post KT (17).

In the pediatric population, 16%–42% experienced PTSD (18–20). Studies of PTSD in pediatric KT patients were limited by small sample sizes and cross-sectional study designs that prevented robust identification of risk factors. Depression was commonly comorbid with PTSD in pediatric patients, although the causal nature of this relationship was unclear (7,20). More severe PTSD symptoms in pediatric KT recipients were also identified as a key factor in lower QOL scores, as in adult studies (4,18). Across all pediatric solid-organ transplant groups, more severe PTSD symptoms were associated with acute (versus chronic) illness onset (odds ratio [OR]=3.36; P=0.02) and more severe medical complications (hospital admission days, number of intensive care unit days, return to dialysis, retransplantation; OR=6.08; P=0.03) (19); higher trauma scores were associated with greater number of medications (r=0.27; P=0.04) and more hospitalized days (r=0.28; P=0.04) (18).

Post-Traumatic Growth

We identified nine publications with a primary construct of PTG after KT in adults. There were no pediatric studies. All were published in 2013 or later (27–35). Six studies collected cross-sectional data from KT recipients (27–29,31,33,34), two collected longitudinal data from KT recipients (30,35), and one was a RCT of a positive psychology intervention (32). These studies described 762 KT recipients. The PTG Inventory (PTGI) was the most common instrument used to identify PTG (Table 3).

Review of the nine publications demonstrated several associations between PTG and KT-related factors and outcomes. Higher (better) PTG scores were associated with higher health-related QOL (r=0.18; P=0.02) (28), and two PTG subscales were associated with improved kidney
function ("spiritual change" subscale, C=7.43, P=0.02; "appreciation of life" subscale, C=7.06, P=0.03) (31). PTG correlated positively with autonomous self-regulation ($R^2=0.08$), which itself positively correlated with physical activity ($R^2=0.12$) (33), whereas lower (worse) PTG scores were associated with increased rate of graft rejection ($OR=0.96; P<0.05$) (30). Factors that appeared to either predict or correlate with higher PTG included being a woman ($F=4.2; P<0.05$) (27); greater resilience ($\rho=0.4$ [LDKT], 0.45 [DDKT]; $P<0.01$) (34), social support ($\rho=0.57; P<0.001$) (28), and self-determination ($\rho=0.33; P<0.001$) (28); perceived health status ($\rho=0.32; P<0.001$) (28); and positive affective tone ($\rho=0.22-0.28; P<0.05$) (35). Demoralization was associated with lower PTG scores (appreciation of life subscale; $P<0.05$) (27). The one RCT demonstrated improved PTG scores ($P<0.05$) after a psychologic intervention (32). Recipients of DDKT had lower PTG on average than LDKT recipients ($P=0.03$) (34), and recipients who experienced rejection had lower PTG than those who had not ($P=0.01$) (30,31) (Table 4). As time elapsed after KT, recipients tended to score higher on the PTGI (27,30–32,34).

**Benefit Finding**

We identified five publications describing the process of benefit finding and related concepts after KT (11,36–39); one focused on the pediatric population (39). Four studies collected cross-sectional data from KT recipients (36–39); one study collected longitudinal data from KT recipients (11). The studies described 475 KT recipients. The studies used a wide variety of approaches, including semi-structured interviews, coping subscales, and other self-report measures to assess benefit finding and related concepts (Table 3).

The one longitudinal study demonstrated increased benefit finding post DDKT and post LDKT ($P\leq0.01$). Across all time points, higher optimism scores were associated with higher benefit finding ($r^2=0.47; P<0.01$), whereas a larger number of physical symptoms ($r^2=-0.15; P=0.02$) and more comorbid conditions ($r^2=-0.28; P<0.01$) were associated with lower benefit finding. During within-person analyses, higher distress pre KT was associated with higher benefit finding post KT ($\beta=0.13; P\leq0.01$), and higher post-KT distress at earlier time point(s) was associated with lower benefit finding at subsequent time point(s) ($\beta=-0.1$;
Table 2. Summary of publication characteristics

| Characteristic                        | All Publications | Construct<sup>a</sup> |
|---------------------------------------|------------------|-----------------------|
|                                       |                  | Post-Traumatic Stress Disorder | Post-Traumatic Growth | Benefit Finding | Resilience |
| Total number (pediatric)              | 39 (10)          | 16 (6)                | 9                     | 5 (1)           | 11 (4)     |
| Journals—total unique                 | 28               | 11                    | 9                     | 4               | 9          |
| *Pediatric Transplant*                | 6                | 4                     | 3                     |                 |            |
| *British Journal of Health Psychology*| 2                | 1                     | 1                     |                 |            |
| *General Hospital Psychiatry*         | 2                | 1                     | 1                     |                 |            |
| *PLoS One*                            | 2                | 2                     |                       |                 |            |
| *Psychosomatics*                      | 2                | 2                     |                       |                 |            |
| *Qualitative Health Research*         | 2                | 2                     |                       |                 |            |
| *Traumatology*                        | 2                | 2                     |                       |                 |            |
| Other                                 | 21               | 7                     | 8                     | 2               | 5          |
| Study country—total unique            | 18               | 7                     | 6                     | 4               | 8          |
| United States                         | 6                | 5                     |                       |                 |            |
| Canada                                | 5                | 1                     | 1                     | 2               | 1          |
| N/A (review)                          | 4                | 4                     |                       |                 |            |
| Poland                                | 4                | 2                     | 2                     |                 |            |
| Hungary                               | 3                | 3                     |                       |                 |            |
| Germany                                | 2                |                       |                       |                 |            |
| Japan                                 | 2                | 2                     |                       |                 |            |
| Netherlands                           | 2                |                       |                       |                 |            |
| Other                                 | 11               | 4                     | 3                     | 1               | 3          |
| Year of publication (range)           | 2001–2021        | 2004–2021             | 2013–2021             | 2005–2021       | 2014–2021  |

**Study type**

| Cross-sectional (post KT)             | 22               | 6                     | 6                     | 4               | 7          |
| Cross-sectional (pre and post KT)     | 2                |                       |                       |                 |            |
| Longitudinal (post KT)                | 3                | 1                     | 2                     |                 |            |
| Longitudinal (pre and post KT)        | 3                | 2                     | 1                     |                 |            |
| Interventional study                  | 3                | 1                     | 1                     |                 |            |
| Retrospective chart review            | 2                | 2                     |                       |                 |            |
| Literature review                     | 4                | 4                     |                       |                 |            |

*KT, kidney transplant.  
<sup>a</sup>Note that two publications involve more than one construct; some columns may add up to more than the total for All Publications.

Table 3. Range of instruments and techniques used to screen for PTSD symptoms and/or establish a PTSD diagnosis

| Source of Data                           | Post-Traumatic Stress Disorder | Post-Traumatic Growth | Benefit Finding | Resilience |
|------------------------------------------|--------------------------------|-----------------------|-----------------|------------|
| Chart review                             | 1                              |                       |                 |            |
| Semi-structured interview (SCID or similar) | 3                              |                       |                 |            |
| Qualitative evaluation of semi-structured interview | 1                              |                       | 2               | 4          |

**Psychometric instrument**

| Instrument                               | Post-Traumatic Stress Disorder | Post-Traumatic Growth | Benefit Finding | Resilience |
|------------------------------------------|--------------------------------|-----------------------|-----------------|------------|
| Impact of Event Scale—Revised            | 1                              |                       |                 |            |
| Davidson Trauma Scale                    | 2                              |                       |                 |            |
| PTSD Checklist—Civilian Version          | 2                              |                       |                 |            |
| UCLA PTSD Index for the DSM              | 1                              |                       |                 |            |
| Childhood PTSD Reaction Index            | 1                              |                       |                 |            |
| Child Trauma Screening Questionnaire     | 1                              |                       |                 |            |
| Post Traumatic Growth Inventory          | 7                              |                       |                 |            |
| Stress-related Growth Scale              | 1                              |                       |                 |            |
| Dutch Illness Cognition Questionnaire, Disease Benefits Subscale | 1                              |                       |                 |            |
| Ryff’s Psychologic Well-Being Assessment, Personal Growth Factor | 1                              |                       |                 |            |
| Ways of Coping, Positive Reappraisal Subscale | 1                              |                       |                 |            |
| Resiliency Assessment Scale for Children and Adolescents | 1                              |                       |                 |            |
| Resilience Scale                         | 2                              |                       |                 |            |
| Connor–Davidson Resiliency Scale        | 1                              |                       |                 |            |
| Resilience Coping Scale Questionnaire    | 1                              |                       |                 |            |
P<0.05) (11). In contrast, when comparing KT recipients with dialysis patients using the Positive Reappraisal subscale of the Ways of Coping Questionnaire, there were no differences in subscale or total scores (38). In a cross-sectional study using Ryff’s Psychologic Well-Being for Personal Growth, personal growth scores were higher among KT recipients relative to donors (t test =2.13; P=0.03) (36).

Two qualitative studies were conducted with KT recipients: one in a pediatric population and the other in adults who had suffered graft loss. For adults suffering graft loss, meaning making was one of the primary themes identified, with participants identifying a positive change in their interpersonal relationships or outlook on life resulting from organ failure and a renewed sense of purpose after organ failure (37). Pediatric patients described undergoing adjustment and personal growth despite the challenges and adversities of kidney failure (39).

### Resilience

We identified 11 publications describing resilience during and after KT (25,34,40–48); four focused on the pediatric population (25,44–46). Seven studies collected cross-sectional data from KT recipients (34,43–48), one collected cross-sectional data from both candidates and recipients (41,42), one was a review (25), and one was a self-described “quasi-experimental interventional pre-test-post-test research with control group” study (40). A total of 700 KT recipients were described in these studies. Four studies used semi-structured interviews, two used the Connor-Davidson Resilience Scale, two used the Resilience Scale, one used the Resilience Assessment Scale for Children and Adolescents, and one study used the Resilience Coping Scale Questionnaire (Table 3).

Among adults, higher resilience scores post KT were associated with higher PTGI scores (34). Qualitative studies revealed themes related to both resilience and PTG (48). Resilience training was found to improve self-efficacy (P<0.001), social adjustment (P<0.03), and empowerment (P<0.001) in KT recipients (40). Resilience was associated with lower psychologic distress (OR=0.945; P<0.01) (43) and did not appear to vary significantly between DDKT and LDKT recipients (42) or between KT recipients and candidate donors (41).

Pediatric studies also demonstrated improved outcomes associated with resilience. Higher resiliency scores were associated with a small (r=0.26, P<0.05) but statistically significant positive correlation with medication adherence (44). Resilience was associated with parenting styles characterized by attentiveness, sensitivity, and emotional involvement (r=0.34, P<0.01) and support of child autonomy (r=0.27, P<0.01), and strong, trusting relationships with the health care team (45,46). Resilience themes of “expressing confidence in the health care team” and “feeling a sense of connection” at the time of KT promoted stable transitions in KT care after transition from pediatric to adult providers (46).

### Discussion

Solid-organ transplant recipients undergo a physical transformation and a so-called psychic transplantation as they emotionally and cognitively integrate a new organ into their body and self-identity (30). Historically, the potentially traumatic nature of organ failure and transplantation was examined within a psychodynamic framework to characterize the effect of organ failure and living with another’s organ(s). The transplanted organ as a “foreign body” was reported to elicit a variety of intrapsychic conflicts. Men receiving organs from donors who were women were described to question their sexuality, and some recipients feared (or hoped) they would assume the personality characteristics of the donor (49).

More recently, investigators have studied organ failure and transplantation as potentially inciting traumatic events leading to PTSD symptoms and/or PTG (5). Compared with transplantation of other solid organs, KT is unique in that recipients have the alternative therapeutic option of maintenance dialysis therapy. Although QOL typically improves after KT, compared with maintenance dialysis (2,42), this is not universally true, and patients can question their decision to exchange the routine and social support provided by dialysis for the side effects of immunosuppressive regimens, risk of rejection, and postoperative complications (3,8). As with patients with other chronic medical conditions, KT recipients describe significant “treatment burden” when caring for their transplanted kidney; treatment burden can cause fatigue, mental exhaustion, and impinge on prior social roles (8).

In the current review, we systematically reviewed the literature to identify 39 publications exploring the prevalence, role, and effect of PTSD, PTG, and related constructs in KT recipients. Our review revealed three key points.

First, KT increases risk for PTSD symptoms, although recipients can experience psychologic growth in response to the same stressors. KT recipients reported more frequent and intense PTSD symptoms than dialysis patients did (16). The reported PTSD prevalence ranged from 0.4% to 42% of KT recipients. Prevalence was affected by severity and duration of kidney disease (LRKT recipients had lower prevalence compared with DDKT recipients), evaluation method (self-report measures resulted in higher prevalence than clinician evaluation), and age of recipient (children had higher prevalence than adults) (4,14,20). Because symptoms of PTSD present differently across developmental stages, diagnostic criteria for PTSD are different for

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### Table 4. Post-traumatic growth inventory score by kidney transplant recipient characteristics

| Kidney Transplant Recipient Characteristics | Post-Traumatic Growth Inventory Score, Average (n) |
|--------------------------------------------|-----------------------------------------------|
| All KT recipients                           | 56.8 (429)                                     |
| Prior organ rejection                       |                                               |
|     Yes                                     | 50.21 (59)<sup>b</sup>                        |
|     No                                      | 60.98 (109)<sup>b</sup>                       |
| Donor type                                 |                                               |
|     Living                                  | 74 (44)<sup>c</sup>                           |
|     Deceased                                | 59.07 (211)<sup>c</sup>                       |

KT, kidney transplant. 
<sup>a</sup>PTG Inventory scores range from 0 to 105. 
<sup>b</sup>P=0.01. 
<sup>c</sup>P=0.03.
children younger than six years old (9), thus limiting comparability across pediatric studies to adult patients (7). Although prior trauma exposure (with no known PTSD diagnosis) increased risk for PTSD post KT (4), a previous PTSD diagnosis did not affect death, graft loss, or medication nonadherence risk post KT (17), possibly highlighting the negative effect of undiagnosed mental illness. PTSD post KT was associated with increased prevalence of other psychiatric comorbidities and poorer QOL and sleep (4,7,16,20). It was unclear whether these associations represented risk factors for PTSD or outcomes related to PTSD due to the limited number of longitudinal studies capturing both KT candidates and recipients (only available for adult LRKT recipients).

Second, and in contrast, PTG was associated with improved kidney function (30,31), health-related QOL (28), and physical activity (33). Recipients of living donor organs, and those with no prior history of organ rejection, had higher average PTGI scores (30,31,34) (Table 4). There are conflicting opinions as to the effect of time after trauma on level of benefit finding and/or PTG (11). The publications included in this review demonstrated increasingly higher benefit finding as time elapsed post KT (11), but there were insufficient data to characterize PTG trajectory after KT. The related construct of resilience tended to be a static quality, not affected by transplant status (41,42), consistent with the general understanding of resilience as a personality characteristic that may modulate the level of stress perceived during a traumatic event (12).

Third, underlying characteristics such as resilience affected how recipients responded to kidney failure and transplantation. Resilience was associated with increased adherence (44), feeling connected to the health care team (46), lower psychologic distress (43), and an improved ability to express emotions, retain control, look for opportunities/positive refocusing, appreciate different aspects of life, take responsibility for behaviors, and make choices in line with wishes (48). Resilience has been proposed to reduce the intensity of distress experienced during a traumatic event, thus making it less likely the individual experiences distress and undergoes PTG (12). Interestingly, resilience in KT recipients was associated with greater PTG (34), and often overlapped with PTG during thematic qualitative analysis (45). This may speak to the unique type or level of distress experienced by KT recipients or the extended duration of stressors from kidney failure and transplantation.

Although a thorough discussion of approaches to target PTSD and promote PTG, benefit finding, and resilience was beyond the scope of this review, two publications meeting inclusion criteria demonstrated benefit from interventions to promote resilience (40) and PTG (32). Other studies, which did not meet our inclusion criteria, supported the use of cognitive behavioral therapy–based approaches such as Quality of Life Therapy and psychologic counseling and Mindfulness Based Stress Reduction to improve psychologic distress and quality of life for KT candidates (50–52). Developing interventions to specifically target PTG, resilience, and benefit finding pre and post KT will be important next steps for clinicians and researchers.

A major strength of this review is our focus on the underappreciated but pivotal constructs of PTSD, PTG, resilience, and benefit finding after KT. Our review highlights the importance of these constructs in relation to graft outcomes and provides an impetus for future research in these areas. Future research directions will include expanding our understanding of these constructs, facilitating the development of interventions to strengthen resilience and promote PTG and benefit finding, and evaluating the effect of these interventions on adherence, graft function, and patient survival.

Our review has limitations. First, our search across four databases may have missed relevant literature indexed in other sources. Second, we included full-text studies. There may be relevant conference proceedings, trial registrations, and other gray literature that were not captured. Third, our analyses were primarily descriptive because the publications were not amendable to analysis by standardized quality assessment tools.

In summary, the pathway each recipient will take post KT remains challenging, if not impossible, to predict. Investigators are just starting to understand the role of psychologic stress during kidney failure and transplantation. PTSD, PTG, and related constructs are relatively new additions to the fields of psychiatry and psychology. The DSM first described PTSD in 1980 (9). PTG and related constructs were first discussed, primarily in the oncology literature, in the 1980s and 1990s (10,53,54). However, as demonstrated by this review, PTSD, PTG, and related constructs affect patient well-being and graft function. Multidisciplinary collaborations (23) among nephrologists, psychiatrists, and psychologists are needed to address empirical gaps in the literature and to develop and evaluate interventions to support PTG, benefit finding, and resiliency in KT candidates and recipients.

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Author Contributions

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Data Sharing Statement
All data are included in the manuscript and/or supporting information.

Supplemental Material
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Search Strategy Report.

References
1. Awan AA, Niu J, Pan JS, Erickson KF, Mandayam S, Winkelmayer WC, Vanenaethan SD, Ramanathan V: Trends in the causes of death among kidney transplant recipients in the United States (1996–2014). Am J Nephrol 48: 472–481, 2018 https://doi.org/10.1159/000495081
2. Kizilisik AT, Feurer ID, VanBuren DH, Wise P, Van Buren D, Hopkins J, Ray J, Nylander W, Shaffer D, Helderman JH, Langone AJ, Speroff T, Pinson CW; Effects of diabetes and cadaveric organs on functional performance and health-related quality of life after kidney transplantation. Am J Surg 186: 535–539, 2003 https://doi.org/10.1016/j.amjsurg.2003.07.013
3. Viswanathan R: Helping patients cope with the loss of a renal transplant. Loss Grief Care 5: 103–113, 1991
4. Possemato K, Geller PA, Quimette P: Posttraumatic stress and quality of life in kidney transplantation recipients. Traumatology 15: 34–39, 2009 https://doi.org/10.1177/1534765608337892
5. Davydow DS, Lease ED, Reyes JF: Posttraumatic stress disorder in organ transplant recipients: A systematic review. Gen Hosp Psychiatry 37: 387–398, 2015 https://doi.org/10.1016/j.genhosppsych.2015.02.005
6. Novak M, Molnar MZ, Szilett L, Kovacs AZ, Vamos EP, Zoller R, Keszei A, Musci I; Depressive symptoms and mortality in patients after kidney transplantation: A prospective prevalent cohort study. Psychosom Med 72: 527–534, 2010 https://doi.org/10.1097/PSY.0b013e3181ebb7d7
7. Supelana C, Annunziato RA, Kaplan D, Helcer J, Stuber ML, Shemesh E; PTSD in solid organ transplant recipients: Current understanding and future implications. Pediatr Transplant 20: 23–33, 2016 https://doi.org/10.1111/pet.12628
8. Lorenz EC, Fegiguren JS, Steggall MD, Cheville AL, Heilman RL, Nair SS, Mai ML, Eton DT: Patient experience after kidney transplant: A conceptual framework of treatment burden. J Patient Rep Outcomes 3: 8, 2019 https://doi.org/10.1186/s41687-019-0095-4
9. American Psychiatric Association: Diagnostic and Statistical Manual of Mental Disorders, 5th Ed., Washington, DC, American Psychiatric Association, 2013 https://doi.org/10.1136/bmj.j5418
10. Tedeschi RG, Calhoun LG: Posttraumatic growth: Conceptual foundations and empirical evidence. Psychol Inq 15: 1–18, 2004 https://doi.org/10.1207/s15327976pi1501_01
11. de Vries AM, Helgeson VS, Schulz T, Almansa J, Westerhuis R, Niesing J, Navis CJ, Snoek MJ, Ranchar AV: Benefit finding in renal transplantation and its association with psychological and clinical correlates: A prospective study. Br J Health Psychol 24: 175–191, 2019 https://doi.org/10.1111/bjhp.12346
12. Nelson DS: The posttraumatic growth path: An emerging model for prevention and treatment of trauma-related behavioral health conditions. J Psychother Integr 21: 1–42, 2011 https://doi.org/10.1037/a0022908
13. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, Shamseer L, Tetzlaff JM, Akl EA, Brennan SE, Chou R, Glanville JM, Grimshaw JM, Hrobjartsson A, Lalu MM, Li T, Loder EW, Mayo-Wilson E, McDonald S, McGuinness LA, Stewart LA, Thomas J, Tricco AC, Welch VA, Whiting P, Moher D: The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. BMJ 372: n71, 2021 https://doi.org/10.1136/bmj.n71
14. Fukunishi I, Sugawara Y, Takayama T, Mukuchu M, Kawarasaki H, Surman OS: Psychiatric disorders before and after living-related transplantation. Psychosomatics 42: 337–343, 2001 https://doi.org/10.1111/j.1525-1348.2001.000124.x
15. Hamama-Raz Y, Ben-Ezra M, Tirosh Y, Banach R, Nakache R: Suffer from dialysis as a predictor of mental health among kidney transplant recipients: A preliminary longitudinal study. Psychiatr Q 88: 879–883, 2017 https://doi.org/10.1007/s11126-017-9501-3
16. Liyvri PG, Dikeos D, Illias I, Lygkoni EP, Helderman JH, Glover D: Traumatic stress symptoms in adolescent organ transplant recipients. Pediatr Transplant 25: e14005, 2021 https://doi.org/10.1111/pet.14005
17. Hind T, Lui S, Moon E, Broad K, Lang S, Schreiber RA, Armstrong K, Blyd-Hansen TD: Post-traumatic stress as a determinant of quality of life in pediatric solid-organ transplant recipients. Pediatr Transplant 25: 52–59, 2020 https://doi.org/10.1111/pet.14024
18. Mintzer LL, Stuber ML, Seacord D, Castaneda M, Mershkhan V, Glover D: Traumatic stress symptoms in adolescent organ transplant recipients. Pediatrics 115: 1640–1644, 2005 https://doi.org/10.1542/peds.2004-0118
19. Wallace J, Yorgin PD, Carolan R, Moore H, Sanchez J, Belson A, Yorgin L, Major C, Granucci L, Alexander S, Arrington D: The use of art therapy to detect depression and post-traumatic stress disorder in pediatric and young adult renal transplant recipients. Pediatr Transplant 8: 52–59, 2004 https://doi.org/10.1046/j.1397-3142.2003.00124.x
20. Possemato K, Quimette P, Geller PA: Internet-based expressive writing for kidney transplant recipients: Effects on posttraumatic stress and quality of life. Traumatology 16: 49–54, 2010 https://doi.org/10.11751/1534765609347545
21. El Mahalawy N, Hatata HA, El Meguid MA, Moneim DA, El Din MH, Hamed Rabee S: Correlates of psychiatric morbidity in Egyptian renal transplant recipients. Middle East Curr Psychiatry. 24: 85–92, 2017 https://doi.org/10.11077/1.8709701.XME.000513070.10881.27
22. De Pasquale C, Veroux M, Indelicato L, Sinagra N, Giaquinta AM, El Din MH, Hamed Rabei S: Correlates of psychiatric morbidity in Egyptian renal transplant recipients. J Psychosom Res 96: 883–888, 2020 https://doi.org/10.1016/j.jpsychores.2020.06.013
23. De Pasquale C, Veroux M, Indelicato L, Sinagra N, Giaquinta AM, El Din MH, Hamed Rabei S: Correlates of psychiatric morbidity in Egyptian renal transplant recipients. Pediatr Transplant 25: e14005, 2021 https://doi.org/10.1111/pet.14005
24. Fukunishi I, Sugawara Y, Takayama T, Mukuchu M, Kawarasaki H, Surman OS: Association between pretransplant psychological assessments and posttransplant psychiatric disorders in living-related transplantation. J Psychosom Res 98: 879–883, 2017 https://doi.org/10.1007/s11126-017-9501-3
25. Amatya K, Moinn K, Steinberg Christofferson E: Psychological functioning and psychosocial issues in pediatric kidney transplant recipients. Pediatr Transplant 25: e13842, 2021 https://doi.org/10.1111/pet.13842
26. Falger J, Landolt MA, Latal B, Hrut EM, Neuhaus TJ, Laube GF: Outcome after renal transplantation. Part II: Quality of life and psychosocial adjustment. Pediatr Nephrol 23: 1640–1644, 2008 https://doi.org/10.1007/s00467-008-0797-x
27. Battaglia Y, Zerbinati L, Piazza G, Martino E, Massarenti S, Provenzano M, Esposito P, Andrucci M, Storari A, Grassi L: The use of demoralization scale in Italian kidney transplant recipients. J Clin Med 9: 2119, 2020 https://doi.org/10.3390/jcm9072119
28. Hwang Y, Kim M, Min K: Factors associated with health-related quality of life in kidney transplant recipients in Korea. PLoS
One 16: e0247934, 2021 https://doi.org/10.1371/journal.pone.0247934

29. Kamran F, Ogden J: Transitions in psychological well-being and life orientation: The phenomenon of post traumatic growth after renal transplantation. Pak J Psychol Res 31: 419–440, 2016

30. Latos M, Devecsey A, Lázár G, Horváth Z, Szerdekerényi E, Szenohradszky P, Csabai M: Psychological rejection of the transplanted organ and graft dysfunction in kidney transplant patients. Transplant Risk Manag 8: 15–24, 2016 https://doi.org/10.2147/TRRM.S104133

31. Latos M, Lázár G, Horváth Z, Wittman V, Szerdekerényi E, Hodi Z, Szenohradszky P, Csabai M: The role of body image integrity and posttraumatic growth in kidney transplantation: A 3-year longitudinal study. Health Psychol Open 2: 2055102915581214, 2015 https://doi.org/10.1177/2055102915581214

32. Latos M, Lázár G, Onórk Z, Szerdekerényi E, Hodi Z, Horváth Z, Csabai M: Positive psychology intervention to improve recovery after renal transplantation: A randomized controlled trial. J Contemp Psychother 35: 35–44, 2021 https://doi.org/10.1007/s10879-021-09515-6

33. Segatto BL, Sabiston CM, Harvey WJ, Bloom GA: Exploring relationships among distress, psychological growth, motivation, and physical activity among transplant recipients. Disabil Rehabil 35: 2097–2103, 2013 https://doi.org/10.3109/09638288.2013.807882

34. Tomaszek A, Wróblewska A, Zdankiewicz-Ścigala E, Rzóca P, Gałązkowski R, Gozdowska J, Lewandowska D, Kosson D, Kosieradzki M, Danielewicz R: Post-traumatic growth among patients living after cadaveric donor kidney transplantation: The role of resilience and alexithymia. Int J Environ Res Public Health 18: 2164, 2021 https://doi.org/10.3390/ijerph18041991

35. Zięba M, Zatorski M, Boczewska M, Gozdowska J, Kieszek R, Laskowski W: The affective tone of narration and posttraumatic growth in organ transplant recipients. Pol Psychol Bull 37: 367–383, 2015 https://doi.org/10.1515/ppb-2015-0044

36. Woldemichael A, Berhanu E, Fritsch C, Satarino C, Demisse A: Psychological well-being of living kidney donors and recipients. Exp Clin Transplant 19: 779–787, 2021 https://doi.org/10.6002/ect.2020.0423

37. Ouellette A, Achille M, Piquet M: The experience of kidney graft failure: Patients’ perspectives. Qual Health Res 19: 1131–1138, 2009 https://doi.org/10.1177/1049732309341733

38. Wojiasik E: How patients with end-stage renal disease manage their condition. Rozc Akad Med Białystok 50: 129–132, 2005

39. Nicholas DE, Picone G, Selikoff EK: The lived experiences of children and adolescents with end-stage renal disease. Qual Health Res 21: 162–173, 2011 https://doi.org/10.1177/1049732310382789

40. Nikoooghtar M, Shahini Z: The effects of resilience training on self-efficacy, empowerment, and social adjustment of renal transplant patients. J Nurs Midwifery Sci. B: 137–144, 2021 https://doi.org/10.4103/jnms.jnms_173_20

41. Müller HH, Englbrecht M, Wiesener MS, Titze S, Heller K, Englbrecht M, Wiesener MS, Siller T, Eckardt KU, Kornhuber J, Maler JM: Kidney-transplant patients receiving living- or dead-donor organs have similar psychological outcomes (findings from the PI-KT study). Ment Illn 12: 17–22, 2020 https://doi.org/10.1111/milj.10900

42. TIAN X, GAO Q, LI G, ZOU C, LIU C, KONG L, LI P: Resilience is associated with low psychological distress in renal transplant recipients. Gen Hosp Psychiatry 39: 86–90, 2016 https://doi.org/10.1016/j.genhosppsych.2015.12.004

43. Biernacka M, Jakubowska-Winecka A, Kalicinski P: Influence of parental attitudes on formation of psychological resilience and adherence to medical regime in adolescents after liver or renal transplantation. Children (Basel) 8: 619, 2021 https://doi.org/10.3390/children8080619

44. Michaud V, Achille M, Chainey F, Phan V, Girardin C, Clermont MJ: Mixed-methods evaluation of a transition and young adult clinic for kidney transplant recipients. Pediatr Transplant 23: e13450, 2019 https://doi.org/10.1111/petr.13450

45. Quinn SM, Fernandez H, McCorkle T, Rogers R, Hussain S, Ford CA, Barg FK, Ginsburg KR, Amaral S: The role of resilience in healthcare transitions among adolescent kidney transplant recipients. Pediatr Transplant 23: e13559, 2019 https://doi.org/10.1111/petr.13559

46. Pinter J, Hansen CS, Chapman JR, Wong G, Craig JC, Schell JO, Tong A: Perspectives of older kidney transplant recipients on kidney transplantation. Clin Am Soc Nephrol 12: 443–453, 2017 https://doi.org/10.2215/CJN.05890616

47. Schipper K, Abma TA, Koops C, Bakker J, Sanderman R, Schreurs MJ: Sweet and sour after renal transplantation: A qualitative study about the positive and negative consequences of renal transplantation. Br J Health Psychol 19: 580–591, 2014 https://doi.org/10.1111/bjhp.12057

48. Lefebvre P, Crombez JC, LeBeuf J: Psychological dimension and psychopathological potential of acquiring a kidney. Can Psychiatr Assoc J 18: 495–500, 1973 https://doi.org/10.1177/070674777301800606

49. Rodrigue JR, Mandelbrot DA, Pavlakis M: A psychological intervention to improve quality of life and reduce psychological distress in adults awaiting kidney transplantation. Nephrol Dial Transplant 26: 709–711, 2011 https://doi.org/10.1093/ndt/gft382

50. Zhao Q, Zhang S, Yu R: Impact of pre-transplantation psychological counseling in improving the mental well-being of patients on hemodialysis. Front Psychiatry 12: 594670, 2021 https://doi.org/10.3389/fpsyt.2021.594670

51. Gross CR, Reilly-Spong M, Park T, Zhao R, Gurchv OV, Ibrahim HN: Telephone-adapted Mindfulness-based Stress Reduction (MBSR) for patients awaiting kidney transplantation. Contemp Clin Trials 37: 37–43, 2017 https://doi.org/10.1016/j.cct.2017.03.014

52. Tedeschi RG, Calhoun LG: The Posttraumatic Growth Inventory: Measuring the positive legacy of trauma. J Trauma Stress 9: 455–471, 1996 https://doi.org/10.1002/jts.2490090305

53. Evers AW, Kraaimaat FW, van Lankveld W, Jongen PJ, Jacobs JW, Bijlsma JW: Beyond unfavorable thinking: The illness cognition questionnaire for chronic diseases. J Consult Clin Psychol 69: 1026–1036, 2001 https://doi.org/10.1037/0022-006X.69.6.1026

54. Weathers FW, Litz BT, Keane TM, Palmieri PA, Marx BP, Schnurr P: The PTSD Checklist (PCL-S). Available at: https://www.ptsd.va.gov/professional/assessment/adult-sr/ptsd-checklist.asp. Accessed August 9, 2022

55. Blanchard EB, Jones-Alexander J, Buckley TC, Forneris CA, Fornier CA: Psychometric properties of the PTSD Checklist (PCL). Behav Res Ther 34: 669–673, 1996 https://doi.org/10.1016/0005-7967(96)00033-2

56. Davidson JR, Thrwarhi HM, Connor KM: Davidson Trauma Scale (DTS): Normative scores in the general population and effect sizes in placebo-controlled SRII trials. Depress Anxiety 15: 75–78, 2002 https://doi.org/10.1002/da.10021

57. McCabe D: The Impact of Events Scale—Revised (IES-R). Try This: Best Practices in Nursing Care to Older Adults The Hartford Institute for Geriatric Nursing, New York, New York University Rory Meyers College of Nursing, 2019, p. 19

58. American Psychiatric Association: Building Resilience at Any Age. Available at: https://www.psychiatry.org/News-room/APA-Blogs/Building-Resilience-at-Any-Age. Accessed May 26, 2022

59. Connor KM, Davidson JR: Development of a new resilience scale: The Connor-Davidson Resilience Scale (CD-RISC). Depress Anxiety 18: 76–82, 2003 https://doi.org/10.1002/da.10113

60. Wagnild GM, Young HM: Development and psychometric evaluation of the Resilience Scale. J Nurs Meas 1: 165–178, 1993

61. Ryff C: Psychological well-being in adult life. Curri Dir Psychol Sci 4: 99–104, 1995 https://doi.org/10.1111/1467-8271.ep10772395

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