Psychiatric Profile of Patients Currently Listed for Kidney Transplantation: Evidence of the Need for More Thorough Pretransplant Psychiatric Evaluations

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ABSTRACT

Background. Patients with end-stage renal disease are at increased risk for psychiatric and cognitive pathologies. Despite this, there is little standardization of the psychosocial and/or psychiatric evaluation of renal transplant candidates. The purpose of this study is to report the frequency of psychiatric and cognitive pathologies and corresponding psychiatric recommendations in a sample of patients actively listed for kidney transplant.

Methods. We performed a retrospective chart review of 104 patients listed for kidney transplant who underwent semistructured psychiatric assessments as part of a novel clinical protocol. Transplant psychiatry routinely administers brief screeners of cognitive functioning and health literacy, also collected from patients' charts.

Results. There were a number of primary psychiatric disorders, including active substance abuse. Even using a conservative cutoff, 52.4% of patients' charts indicated evidence of cognitive impairment, and 28.9% indicated limited health literacy. In addition, there were numerous additional recommendations made within every category (educational, psychotherapeutic/psychiatric, cognitive, cessation of substance use, substance abuse treatment, and mobilizing support for transplant). With the exclusion of the recommendation for more education regarding the transplant process, most patients had at least 1 to 3 recommendations (n = 72, 69.2%).

Conclusions. We have identified a number of concerning psychosocial and psychiatric factors in patients who were evaluated and listed for kidney transplantation that can adversely impact transplant outcomes. The findings provide support for more in-depth and ongoing psychiatric assessments as standard clinical protocol for kidney transplant candidates.

IN 2018, there were 20,412 adult kidney transplants performed in the United States [1]. Patients with chronic kidney disease (CKD) who undergo transplant have improved quality of life, improved overall functioning, and better survival than those who remain on dialysis [2,3]. However, along with potential benefits, kidney transplant still carries medical risk to the patient and, with living donation, to the donor [4,5]. Prior to listing for possible kidney transplant, a candidate undergoes extensive medical

Ethical Approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards.

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testing to estimate the individual's risk of negative outcomes based on the current body of scientific knowledge [6,7]. While there continues to be uncertainty quantifying some areas of risk (eg, cardiovascular), psychosocial guidelines continue to be the least clear [8].

Psychological conditions, such as depression, have the potential to adversely impact outcomes in populations with chronic illness. For example, based on a meta-analysis, depression is associated with a 3-fold increase in nonadherence across clinical patient populations [9]. An estimated 20% to 30% of patients on hemodialysis have symptoms consistent with a major depressive disorder [10,11]. In patients with CKD and kidney transplant recipients, depression is associated with reduced quality of life, reduced adherence to medications, and increased risk for graft loss and mortality [10,12,13]. Kidney transplant recipients display higher rates of nonadherence to medical recommendations than other organ transplant populations with equally complex medical regimens, which has been attributed to less stringent psychosocial criteria pretransplant [14]. Even when patients undergo evaluation, psychosocial guidelines vary regarding evaluation and interventions for potential kidney transplant candidates [6,8,15].

Furthermore, patients with CKD have a well-documented risk of developing cognitive disorders and possible dementia (based on neurocognitive screening and neuroimaging [16,17]), which has been attributed to small and large vessel disease and potential neuronal damage thought to be brought on or perpetuated by numerous assaults related to the disease and its management [16]. Despite guidelines recommending screening for cognitive impairment [6,18], cognitive functioning historically has not been routinely assessed in kidney transplant candidates [8,15]. A related area of functioning is health literacy, which is "the degree to which individuals have the capacity to obtain, process and understand basic health information needed to make appropriate health decisions and use services needed to prevent or treat illness" [19]. Current estimates suggest approximately 22.7% of patients with CKD may have limited health literacy [20]. In patients with CKD undergoing hemodialysis, reduced health literacy has been associated with more missed dialysis treatments, more emergency department visits, and related hospitalizations [21].

Numerous authors call for additional research on psychosocial characteristics and evaluations in patients pursuing kidney transplant [8,15]. Generally, patients undergo annual re-evaluations for continued listing. In early 2013, a novel clinical protocol at our center included requiring listed kidney candidates to undergo semistructured psychiatric evaluation by doctoral level psychologists (including senior staff, fellows, and interns), which included standardized assessment measures of cognitive functioning and health literacy. The purpose of this study is to report the frequency of psychosocial issues and psychiatric disorders in patients listed for kidney transplant at an urban transplant center and to report the frequency of psychosocial and psychiatric recommendations in patients listed for kidney transplant.

MATERIALS AND METHODS

We conducted a retrospective chart review of patients involved in a novel clinical protocol implemented as part of quality improvement. Patients referred for possible kidney transplant undergo extensive presurgical evaluation including psychosocial assessment by a social worker specializing in organ transplantation. However, the psychosocial assessment performed by transplant social work [22,23] is qualitatively different from the psychiatric and cognitive assessment performed by transplant psychology. Historically, at our clinic, a referral to a transplant psychologist occurred when there was an indication of a potential psychiatric issue or concern (as identified by the social worker or other providers) or in all patients older than 70 years to assess cognitive functioning. For the purposes of these analyses, both of these groups were excluded. From April 2013 through March 2014, a process initiative was put in place to improve identification of risk factors for negative outcomes. As such, listed kidney transplant candidates returning for their routine yearly medical re-evaluation were scheduled to undergo semistructured psychiatric evaluation as part of the novel clinical protocol. The purpose of the psychiatric evaluations was to identify any issues with the transplant candidates that may adversely affect outcomes post transplant and address them prior to transplant using best practice strategies. Issues addressed include substance abuse, insufficient support for home care–related needs, cognitive deficits, or other axis I psychiatric disorders.

Data Collection/Instruments

The retrospective data collection was performed following Institutional Review Board approval (no. 7130). To ensure all eligible data were collected, cross-references of provider tracking of care and institutional data stores (both within and external to the department) were performed. Because the semistructured psychiatric interview notes within patient electronic medical records (EMR) are narratives, a codebook was developed for dummy coding qualitative interview content into categorical variables. Trained research assistants, with randomly double-entered patients to ensure ongoing interrater reliability, performed data entry. The primary author (M.T.J.) routinely checked for data entry accuracy.

All data were collected from the psychiatric assessment in patients' EMR. This included evaluation from the semistructured psychiatric interview (content areas outlined in Table 1) and screening instruments of health literacy and cognitive functioning. The screening instruments for health literacy and cognitive functioning routinely used included the Rapid Evaluation of Adult Literacy in Medicine–Revised (REALM-R) and the Montreal Cognitive Assessment (MOCA), outlined below.

Rapid Evaluation of Adult Literacy in Medicine (REALM-R). The REALM-R is a brief, 8-item measure of adult medical literacy. Scores on the REALM-R are out of 7, with scores of 6 or below indicative of less than a ninth grade reading level and risk for poor medical literacy [24]. The REALM-R has been used in other health and community populations as a brief screener for medical literacy [25,26].

Montreal Cognitive Assessment. The Montreal Cognitive Assessment (MOCA) [27] is a brief, 30-item screening tool for cognitive impairment that has been well validated across multiple health populations and has good sensitivity and specificity in patients undergoing hemodialysis [28,29]. The MOCA assesses for

Table 1. Outline of the Semistructured Psychiatric Evaluation for Kidney Transplant

A. Medical history
B. Knowledge and understanding of transplant surgery
  a. Associated risks and benefits
  b. Necessary lifestyle changes post surgery
C. Motivation for transplant
D. Adherence history
E. Psychosocial history
  a. Race/ethnicity
  b. Living situation
  c. Educational attainment
  d. Work status
  e. Religious beliefs
  f. Military and legal history
F. Support system
G. Psychiatric history
  a. Prior/current therapy/treatment
  b. Prior/current psychiatric medications
  c. Prior psychiatric hospitalizations
  d. Prior suicide attempts/behaviors
  e. Closed head injuries, seizures, and/or strokes
H. Current psychiatric symptoms
  a. Mood/depression
  b. Anxiety
  c. Mania/psychosis
  d. Interpersonal difficulties
I. Family psychiatric and substance abuse history
J. Patient substance use and abuse history
K. Patient assessment including the REALM and MOCA

Abbreviations: MOCA, Montreal Cognitive Assessment; REALM, Rapid Evaluation of Adult Literacy in Medicine.

impairments across several domains including executive functioning, memory, attention, language, abstraction, and orientation. The total score and subscales are summed, with lower scores indicating impairment(s). To account for education, respondents with less than a 12th grade education receive an additional point to the overall score. Based on normative data with healthy persons, total scores of 25 or below indicate mild cognitive impairment. The scale has also been validated with patients undergoing chronic hemodialysis for CKD and other medical populations with a cutoff of $\leq$ 24 for detecting mild cognitive impairment [29,30].

Analyses

Descriptives and/or frequencies were run on sociodemographic psychiatric, cognitive, substance abuse characteristics, and assessment measures as outlined above. To compare across relevant groups, several analyses were performed including χ^2 test for categorical variables and Student t test for continuous variables. All analyses were performed using the SPSS version 22 (IBM; Armonk, NY, United States).

RESULTS

From April 2013 through March 2014, 189 patients listed for kidney transplant returned to the main clinic for yearly re-evaluation for continued listing. On process review and further examination of the clinical charts, it was determined that 63 (33.3%) were not scheduled with transplant psychology because of scheduling conflicts (eg, no available transplant psychology appointments when the patient was available to be seen), 2 (1.1%) had existing and ongoing relationships with outside behavioral health providers, 3 (1.6%) had appointments but canceled and did not reschedule, and 1 (0.5%) had an appointment but did not show up. Following a process review, it was determined the reason some patients were not scheduled was because of health psychologists' availability and was not related to scheduler choice or bias. This resulted in 104 patients (54.7%) who underwent psychiatric evaluation by one of the doctoral health psychologists. Demographics of the 104

Table 2. Patient Characteristics

Variable	No. (%)
Sex	
Male	58 (55.8)
Female	46 (44.2)
Race	
American Indian/Alaskan Native	2 (1.9)
Asian	6 (5.7)
Black/African American	61 (58.7)
Other/Multiethnic	2 (1.9)
White	33 (31.4)
Years of education	
Years, mean (SD) (range)	13.39 (2.4) (3-21)
Less than high school	11 (10.6)
High school or GED	47 (45.2)
Associate's degree or equivalent	26 (25.0)
Bachelor's degree or equivalent	12 (11.5)
Master's degree or greater	8 (7.7)
Kidney disease	
Diabetes	17 (16.3)
Hypertension	21 (20.2)
Diabetes and hypertension	27 (26.0)
Polycystic kidney disease	7 (6.7)
Other	26 (25.0)
Unknown etiology	6 (5.8)
REALM-R*	
< 3rd grade reading level	0 (0.0)
4th to 6th grade reading level	5 (5.2)
7th to 8th grade reading level	23 (23.7)
> 9th grade reading level	69 (71.1)
	Mean (SD)
Age, y	52.55 (11.3)
Range	20-69
MOCA total (range)†	23.88 (3.4)
Executive functioning	4.02 (1.1)
Memory	2.42 (1.6)
Attention	5.11 (1.2)
Language	4.44 (1.4)
bstraction	1.24 (0.8)
Orientation	5.81 (0.5)

Abbreviations: GED, general equivalency diploma; MOCA, Montreal Cognitive Assessment; REALM-R, Rapid Evaluation of Adult Literacy in Medicine–Revised.
*Out of the 97 patients who were administered the REALM-R.
†103 patients' full MOCA scores reported, for subscales only 101 patients' scores reported in clinical charts. When patients were not administered either, this was frequently because of time constraints. Possible ranges for the MOCA subscales: Executive functioning 0-5, Memory 0-5, Attention 0-6, Language 0-6, Abstraction 0-2, and Orientation 0-6.

Table 3. Frequency of Active Psychiatric Disorders

Psychiatric Disorder	No. (%)
Cognitive disorders*	14 (13.5)
Depressive disorders	8 (7.7)
Nicotine dependence disorders	6 (5.8)
Cannabis abuse/dependency disorders	5 (4.8)
Learning disorders	2 (1.9)
Anxiety disorders	2 (1.9)
Bipolar disorders	1 (0.9)
Alcohol abuse/dependency disorders	1 (0.9)
Psychotic disorders	1 (0.9)

*Cognitive disorder not otherwise specified, with a differential diagnosis of the suspected dementia.

Table 4. Frequency of Clinical Recommendations (as determined by semistructured clinical interview)

	No. (%)
Recommended further education or resources	7 (6.7)
Psychotherapeutic and/or psychiatric medication evaluation	19 (18.3)
Recommendation of accommodation or further cognitive testing	59 (56.7)
Recommend cessation of tobacco, alcohol, and/or marijuana	20 (19.2)
Recommendations for or verification of substance use treatment	10 (9.6)
Support requires further mobilization	21 (20.2)

patients who underwent psychiatric evaluation are presented in Table 2. There were no significant differences between those who underwent additional psychiatric evaluation compared with those who did not on age ($P = .56$), sex ($P = .79$), black or white race ($P = .76$ or $P = .29$, respectively), or primary kidney disease (diabetes $P = .81$, hypertension $P = .97$, polycystic kidney disease $P = .33$, or diabetes and hypertension $P = .57$). Of the 103 patients whose clinical charts reported total MOCA scores (1 patient did not because of time constraints), scores ranged from 11 to 29; means (standard deviations) of the MOCA scores are presented in Table 2. With an established normative cutoff of ≤ 25, a total of 62 patients (60.2%) appeared to display some level of cognitive impairments. However, applying the more conservative clinical cutoff of ≤ 24, which has been validated to detect mild cognitive impairments in patients with CKD undergoing hemodialysis [29], 54 (52.4%) still would appear cognitively impaired based on brief screening. Of the 97 patients administered the REALM-R (7 were not administered the REALM-R because of time constraints), 28 (28.9%) displayed limited health literacy. Patients reported an average of slightly more than a high school education (Table 2).

Based upon Diagnostic and Statistical Manual for Mental Disorders, 4th edition, Text Revision (DSM-IV-TR, 2000) criteria, there were a number of psychiatric diagnoses present in this sample. Sixty-five patients (62.5%) received no formal diagnosis or an adjustment-related disorder associated with their kidney disease. For the remaining 39 patients, frequencies of active psychiatric disorders are reported in Table 3. Clinical guidelines on diagnosing dementia require assessment across multiple domains including cognitive functioning, neuroimaging, and additional laboratory testing depending on patient presentation [31,32]. Because these were initial diagnostic interviews, adequate evidence for a full diagnosis of dementia was frequently not available at that time, and therefore the patients would be given a diagnosis of Cognitive Disorder Not Otherwise Specified, with a differential diagnosis of the suspected dementia (represented by * in Table 3). As indicated in Table 4, the most frequent recommendation was for either further evaluation of cognitive testing or accommodation.

Also of note, there were several patients who disclosed substance abuse and/or dependency disorders in remission, including nicotine dependence (n = 6, 5.8%), alcohol abuse and/or dependence (n = 4, 3.8%), cannabis abuse (n = 3, 2.9%), cocaine abuse and/or dependence (n = 1, 0.9%), and polysubstance abuse and/or dependence (n = 1, 0.9%). There was overlap of substances in several individuals. For example, 1 person reported a history of cannabis and cocaine abuse. However, the most frequent combination was a history of nicotine and alcohol or in several cases ongoing nicotine dependence despite abstinence of alcohol. Of the patients who qualified for a substance abuse and/or dependency diagnosis in remission, 6 were of sufficient clinical concern and short time of abstinence that they were referred for substance abuse treatment or relapse prevention.

Given the overall psychiatric profile of the patients who underwent evaluation, there were a number of recommendations based upon the semistructured psychiatric interviews. As can be seen in Table 4, recommendations included further education regarding the transplant process, psychotherapeutic and/or psychiatric intervention, accommodation for cognitive deficits or further cognitive testing, cessation of substance use (nicotine, alcohol, and/or illicit substances), substance abuse and/or dependency treatment or verification of treatment, and/or mobilization of social support to meet post-transplant support needs. The majority of patients had 1 to 3 recommendations (n = 72, 69.2%), not counting the recommendation for additional education to better understand the transplant process.

DISCUSSION

There have been numerous calls for research on psychiatric and psychosocial characteristics in kidney transplant candidates to improve clinical guidelines for listing as well as address poor transplant adjustment and relapse outcomes [8,15]. Areas of psychosocial concern include cognitive functioning and health literacy, substance use and abuse, mood or other psychiatric illness, and social support. When psychosocial or psychiatric issues are present, identification and intervention has the potential to improve patient outcomes post transplant [14]. However, such guidelines have

yet to be adequately determined. In this sample, a number of potentially concerning psychiatric and psychosocial factors were identified. However, the findings of this study likely underestimate the frequency of issues because these were patients who had been evaluated by social work and were listed for kidney transplant.

Patients with CKD have a well-documented risk of developing cognitive impairments and possible dementia [16,17]. Consistent with the prior literature, in this sample, there was evidence of impairments across several domains of functioning based on a brief screener. With a conservative cutoff, as previously validated on patients with CKD on hemodialysis [29], over half of this sample displayed at least mild cognitive impairment. Current recommendations suggest, in the context of cognitive impairment, that patients need to have an adequate understanding of the risks and benefits of kidney transplant [6,8]. However, these recommendations do not provide a direction of how this should be achieved. This is particularly concerning given that patients and providers are frequently unaware of cognitive deficits [33–35]. Furthermore, while there was some variability in understanding, the clear majority of patients (97, 93.3%) were able to explain general risks, benefits, and basic ongoing responsibilities related to kidney transplant despite possible cognitive impairments. However, clearly more than education is needed in the context of cognitive impairments. Further research is warranted examining patient level of understanding across domains of cognitive impairments and identifying strategies to help facilitate retention of information post transplant. Cognitive functioning may improve post transplant, but both cross-sectional and prospective studies to date [36,37] have significant methodological limitations, thereby limiting current findings. Patients who have greater awareness of memory impairments also display greater adherence to immunosuppressant medications [38]. Ultimately, screening for cognitive functioning to identify areas of need and mobilization of support should be part of routine clinical care. Unfortunately, there is very little empirical literature on effective strategies to best assist patients in this respect. The current general literature recommends repeated education tailored to patient needs [39], but specific strategies require further study in patients with CKD with cognitive impairments. Also, there has been a call for research to better understand health literacy in patients with kidney disease and kidney transplantation [20,40]. Across this sample, almost one-third displayed limited health literacy. This is a sizable proportion when considering reduced health literacy's negative impact on outcomes [21]. However, interventions aimed at addressing low levels of health literacy have yet to consistently display sustained improvements in outcomes [41], and further research is needed.

While low to moderate alcohol intake post kidney transplant is not associated with negative outcomes or may even be protective [42], it is important to differentiate between alcohol use vs alcohol abuse or dependence. Alcohol abuse and dependency are maladaptive patterns of use [43] associated with a multitude of negative outcomes [44,45]. Pretransplant substance abuse and/or dependency has been associated with post-transplant substance use, greater risk of renal graft failure, and mortality [46,47]. Although a small proportion of kidney transplant candidates met criteria for an active alcohol disorder, those with an alcohol disorder in remission displayed variable lengths of abstinence from alcohol at the time of evaluation. Based on known risk factors for alcohol abuse and/or dependency relapse (eg, history of prior periods of abstinence with relapse, family history, current environment, maladaptive coping strategies [48,49]), it was determined that several of these patients would benefit from substance abuse treatment to reinforce abstinence strategies and reduce the risk of relapse in the future. These recommendations would not have been made had these patients not undergone the additional evaluations.

There is ample evidence of the negative impact of smoking in the context of CKD, especially in the presence of hypertension and other cardiovascular risks [50]. Although research on nicotine use in kidney transplantation is still sparse, smoking is associated with an independent risk of patient death in kidney transplant recipients and therefore should be discouraged [51]. Even less is known about marijuana. There is currently considerable debate over marijuana use across various clinical populations, but in the interest of ameliorating as much risk as possible at our center, when a kidney transplant candidate reports marijuana use, the purpose for its use is explored (eg, relaxation, pain management). When evidence of abuse and/or dependency is present, treatment recommendations are made to minimize substance abuse risk.

Several listed kidney transplant candidates met diagnostic criteria for a depressive disorder or a mood disorder. As outlined in the introduction, depression is associated with negative outcomes in chronic illness populations, including reduced quality of life, increased nonadherence, graft loss, and mortality [9,10,12,13]. Although the frequency of mood disruption in this sample was lower than previously published data of similar populations [10], the findings in this study suggest research is needed to differentiate whether listing status (eg, listed on dialysis, listed not on dialysis, not listed) impacts patient depression. Also, distinguishing between distress, anxiety, and depression impacts treatment-related options to maximize benefits from interventions [13]. Appropriate identification of at-risk patients allows for either referral or implementation of empirically-based interventions to address depression, improve patient-related quality of life, and reduce overall risk.

This study has several limitations. First, because this is a retrospective chart review of a clinical protocol, the data are inherently limited to what is in patients' EMRs. We made every effort to extract the data as accurately and thoroughly as possible. Second, although these data represent a subsample of listed patients from a large clinic with a highly diverse patient population, pulling from a large geographic area, the findings of this study likely underrepresent the

frequency of issues in the entire patient population of kidney transplant candidates. We would encourage additional research in the identification of and interventions aimed at addressing psychosocial risk factors. Lastly, and perhaps most importantly, we were not able to report on a random sample of patients who presented for evaluation to become listed for kidney transplant. To identify the prevalence of risk factors and psychiatric disorders in patients presenting for kidney transplant, further research is needed evaluating large samples of patients referred for evaluation for kidney transplant listing and follow-up throughout the transplant process.

CONCLUSIONS

Because the data presented here represent a sample of patients listed for transplant, this study provides evidence supporting the need for more thorough psychosocial evaluation of kidney transplant candidates throughout critical periods of the transplant evaluation and listing process. Identifying psychosocial risk factors would assure risk mitigation and improve outcomes following kidney transplant. In this series, we found evidence of limited health literacy, cognitive deficits, substance abuse (including cases of substance abuse and/or dependence in remission that would have benefited from treatment for sustained abstinence) and undiagnosed psychiatric illnesses in patients currently listed for kidney transplant. Identification of these issues and development of specific interventions are needed with measures of efficacy that so far are lacking in the available literature. This forms the basis for potential research in an effort to achieve the best possible outcomes after kidney transplant.

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REFERENCES

[1] US Department of Health and Human Services. National data from the Organ Procurement and Transplantation Network [Accessed 19.04.30], https://optn.transplant.hrsa.gov/; 2019.

[2] Joshi SA, Almeida N, Almeida A. Assessment of the perceived quality of life of successful kidney transplant recipients and their donors pre- and post-transplantation. Transplant Proc 2013;45:1435–7. https://doi.org/10.1016/j.transproceed.2013.01.037.

[3] Nathan HM, Conrad SL, Held PJ, McCullough KP, Pietroski RE, Siminoff LA, et al. Organ donation in the United States. Am J Transplant 2003;3(Suppl. 4):29–40.

[4] Alangaden GJ, Thyagarajan R, Gruber SA, Morawski K, Garnick J, El-Amm JM, et al. Infectious complications after kidney transplantation: current epidemiology and associated risk factors. Clin Transplant 2006;20:401–9. https://doi.org/10.1111/j.1399-0012.2006.00519.x.

[5] Mjoen G, Hallan S, Hartmann A, Foss A, Midtvedt K, Oyen O, et al. Long-term risks for kidney donors. Kidney Int 2014;86:162–7. https://doi.org/10.1038/ki.2013.460.

[6] Knoll G, Cockfield S, Blydt-Hansen T, Baran D, Kiberd B, Landsberg D, et al. Canadian Society of Transplantation consensus guidelines on eligibility for kidney transplantation. CMAJ 2005;173:1181–4. https://doi.org/10.1503/cmaj.1041588.

[7] Bunnapradist S, Danovitch GM. Evaluation of adult kidney transplant candidates. Am J Kidney Dis 2007;50:890–8. https://doi.org/10.1053/j.ajkd.2007.08.010.

[8] Batabyal P, Chapman JR, Wong G, Craig JC, Tong A. Clinical practice guidelines on wait-listing for kidney transplantation: consistent and equitable? Transplantation 2012;94:703–13. https://doi.org/10.1097/TP.0b013e3182637078.

[9] DiMatteo MR, Lepper HS, Croghan TW. Depression is a risk factor for noncompliance with medical treatment: meta-analysis of the effects of anxiety and depression on patient adherence. Arch Intern Med 2000;160:2101–7.

[10] Zalai D, Szeifert L, Novak M. Psychological distress and depression in patients with chronic kidney disease. Semin Dial 2012;25:428–38. https://doi.org/10.1111/j.1525-139X.2012.01100.x.

[11] Avramovic M, Stefanovic V. Health-related quality of life in different stages of renal failure. Artif Organs 2012;36:581–9. https://doi.org/10.1111/j.1525-1594.2011.01429.x.

[12] Corruble E, Barry C, Varescon I, Durrbach A, Samuel D, Lang P, et al. Report of depressive symptoms on waiting list and mortality after liver and kidney transplantation: a prospective cohort study. BMC Psychiatry 2011;11:182. https://doi.org/10.1186/1471-244X-11-182.

[13] Cukor D, Rosenthal DS, Jindal RM, Brown CD, Kimmel PL. Depression is an important contributor to low medication adherence in hemodialyzed patients and transplant recipients. Kidney Int 2009;75:1223–9. https://doi.org/10.1038/ki.2009.51.

[14] Dew MA, DiMartini AF, De Vito Dabbs A, Myakovsky L, Steel J, Unruh M, et al. Rates and risk factors for nonadherence to the medical regimen after adult solid organ transplantation. Transplantation 2007;83:858–73. https://doi.org/10.1097/01.tp.0000258599.65257.a6.

[15] Anderson K, Cass A, Cunningham J, Snelling P, Devitt J, Preece C. The use of psychosocial criteria in Australian patient selection guidelines for kidney transplantation. Soc Sci Med 2007;64:2107–14. https://doi.org/10.1016/j.socscimed.2007.02.012.

[16] Bugnicourt JM, Godefroy O, Chillon JM, Choukroun G, Massy ZA. Cognitive disorders and dementia in CKD: the neglected kidney-brain axis. J Am Soc Nephrol 2013;24:353–63. https://doi.org/10.1681/ASN.2012050536.

[17] Vogels SC, Emmelot-Vonk MH, Verhaar HJ, Koek HL. The association of chronic kidney disease with brain lesions on MRI or CT: a systematic review. Maturitas 2012;71:331–6. https://doi.org/10.1016/j.maturitas.2012.01.008.

[18] Kasiske BL, Cangro CB, Hariharan S, Hricik DE, Kerman RH, Roth D, et al. The evaluation of renal transplantation candidates: clinical practice guidelines. Am J Transplant 2001;1(Suppl. 2):3–95.

[19] Health Resources & Services Administration. Health literacy [Accessed 19.04.30], https://www.hrsa.gov/about/organization/bureaus/ohe/health-literacy/index.html; 2019.

[20] Fraser SD, Roderick PJ, Casey M, Taal MW, Yuen HM, Nutbeam D. Prevalence and associations of limited health literacy in chronic kidney disease: a systematic review. Nephrol Dial Transplant 2013;28:129–37. https://doi.org/10.1093/ndt/gfs371.

[21] Green JA, Mor MK, Shields AM, Sevick MA, Arnold RM, Palevsky PM, et al. Associations of health literacy with dialysis adherence and health resource utilization in patients receiving maintenance hemodialysis. Am J Kidney Dis 2013;62:73–80. https://doi.org/10.1053/j.ajkd.2012.12.014.

[22] Greene GM. Description of a psychosocial assessment instrument and risk criteria to support social work recommendations for kidney transplant candidates. Soc Work Health Care 2013;52:370–96. https://doi.org/10.1080/00981389.2013.764378.

[23] Fisher MS. Psychosocial evaluation interview protocol for pretransplant kidney recipients. Health Soc Work 2006;31:137–44.

[24] Bass PF, Wilson JF, Griffith CH. A shortened instrument for literacy screening. J Gen Intern Med 2003;18:1036–8.

[25] Chaudhry SI, Herrin J, Phillips C, Butler J, Mukerjhee S, Murillo J, et al. Racial disparities in health literacy and access to care among patients with heart failure. J Card Fail 2011;17:122–7. https://doi.org/10.1016/j.cardfail.2010.09.016.

[26] Bains SS, Egede LE. Association of health literacy with complementary and alternative medicine use: a cross-sectional study in adult primary care patients. BMC Complementary Altern Med 2011;11:138. https://doi.org/10.1186/1472-6882-11-138.

[27] Nasreddine ZS, Phillips NA, Bedirian V, Charbonneau S, Whitehead V, Collin I, et al. The Montreal Cognitive Assessment, MoCA: a brief screening tool for mild cognitive impairment. J Am Geriatr Soc 2005;53:695–9. https://doi.org/10.1111/j.1532-5415.2005.53221.x.

[28] Freitas S, Simoes MR, Alves L, Vicente M, Santana I. Montreal Cognitive Assessment (MoCA): validation study for vascular dementia. J Int Neuropsychol Soc 2012;18:1031–40. https://doi.org/10.1017/S135561771200077X.

[29] Tiffin-Richards FE, Costa AS, Holschbach B, Frank RD, Vassiliadou A, Kruger T, et al. The Montreal Cognitive Assessment (MoCA) - a sensitive screening instrument for detecting cognitive impairment in chronic hemodialysis patients. PloS One 2014;9:e106700. https://doi.org/10.1371/journal.pone.0106700.

[30] Tsoi KK, Chan JY, Hirai HW, Wong SY, Kwok TC. Cognitive tests to detect dementia: a systematic review and meta-analysis. JAMA Intern Med 2015;175:1450–8. https://doi.org/10.1001/jamainternmed.2015.2152.

[31] Ngo J, Holroyd-Leduc JM. Systematic review of recent dementia practice guidelines. Age Ageing 2015;44:25–33. https://doi.org/10.1093/ageing/afu143.

[32] Waldemar G, Dubois B, Emre M, Georges J, McKeith IG, Rossor M, et al. Recommendations for the diagnosis and management of Alzheimer's disease and other disorders associated with dementia: EFNS guideline. Euro J Neurol 2007;14:e1–26. https://doi.org/10.1111/j.1468-1331.2006.01605.x.

[33] O'Connell ME, Dal Bello-Haas V, Crossley M, Morgan D. Clinical correlates of awareness for balance, function, and memory: evidence for the modality specificity of awareness. J Aging Res 2014;2014:674716. https://doi.org/10.1155/2014/674716.

[34] Raymont V, Bingley W, Buchanan A, David AS, Hayward P, Wessely S, et al. Prevalence of mental incapacity in medical inpatients and associated risk factors: cross-sectional study. Lancet 2004;364:1421–7. https://doi.org/10.1016/S0140-6736(04)17224-3.

[35] Valcour VG, Masaki KH, Curb JD, Blanchette PL. The detection of dementia in the primary care setting. Arch Intern Med 2000;160:2964–8.

[36] Gelb S, Shapiro RJ, Hill A, Thornton WL. Cognitive outcome following kidney transplantation. Nephrol Dial Transplant 2008;23:1032–8. https://doi.org/10.1093/ndt/gfm659.

[37] Griva K, Hansraj S, Thompson D, Jayasena D, Davenport A, Harrison M, et al. Neuropsychological performance after kidney transplantation: a comparison between transplant types and in relation to dialysis and normative data. Nephrol Dial Transplant 2004;19:1866–74. https://doi.org/10.1093/ndt/gfh141.

[38] Cheng CY, Lin BY, Chang KH, Shu KH, Wu MJ. Awareness of memory impairment increases the adherence to immunosuppressants in kidney transplant recipients. Transplant Proc 2012;44:746–8. https://doi.org/10.1016/j.transproceed.2011.11.030.

[39] Campbell NL, Boustani MA, Skopelja EN, Gao S, Unverzagt FW, Murray MD. Medication adherence in older adults with cognitive impairment: a systematic evidence-based review. Am J Geriatr Pharmacother 2012;10:165–77. https://doi.org/10.1016/j.amjopharm.2012.04.004.

[40] Dageforde LA, Cavanaugh KL. Health literacy: emerging evidence and applications in kidney disease care. Adv Chronic Kidney Dis 2013;20:311–9. https://doi.org/10.1053/j.ackd.2013.04.005.

[41] Brainard J, Wilsher SH, Salter C, Loke YK. Methodological review: quality of randomized controlled trials in health literacy. BMC Health Serv Res 2016;16:246. https://doi.org/10.1186/s12913-016-1479-2.

[42] Zelle DM, Agarwal PK, Ramirez JL, van der Heide JJ, Corpeleijn E, Gans RO, et al. Alcohol consumption, new onset of diabetes after transplantation, and all-cause mortality in renal transplant recipients. Transplantation 2011;92:203–9. https://doi.org/10.1097/TP.0b013e318222ca10.

[43] Diagnostic and statistical manual of mental disorders. Text Revision. 4th ed. Washington, DC: American Psychiatric Association; 2000.

[44] Hasin DS, Stinson FS, Ogburn E, Grant BF. Prevalence, correlates, disability, and comorbidity of DSM-IV alcohol abuse and dependence in the United States: results from the National Epidemiologic Survey on Alcohol and Related Conditions. Arch Gen Psychiatry 2007;64:830–42. https://doi.org/10.1001/archpsyc.64.7.830.

[45] Kuzma E, Llewellyn DJ, Langa KM, Wallace RB, Lang IA. History of alcohol use disorders and risk of severe cognitive impairment: a 19-year prospective cohort study. Am J Geriatr Psychiatry 2014;22:1047–54. https://doi.org/10.1016/j.jagp.2014.06.001.

[46] Dew MA, DiMartini AF, Steel J, De Vito Dabbs A, Myaskovsky L, Unruh M, et al. Meta-analysis of risk for relapse to substance use after transplantation of the liver or other solid organs. Liver Transpl 2008;14:159–72. https://doi.org/10.1002/lt.21278.

[47] Gueye AS, Chelamcharla M, Baird BC, Nguyen C, Tang H, Barenbaum AL, et al. The association between recipient alcohol dependency and long-term graft and recipient survival. Nephrol Dial Transplant 2007;22:891–8. https://doi.org/10.1093/ndt/gfl689.

[48] Adamson SJ, Sellman JD, Frampton CM. Patient predictors of alcohol treatment outcome: a systematic review. J Subst Abuse Treat 2009;36:75–86. https://doi.org/10.1016/j.jsat.2008.05.007.

[49] Moos RH, Moos BS. Rates and predictors of relapse after natural and treated remission from alcohol use disorders. Addiction 2006;101:212–22. https://doi.org/10.1111/j.1360-0443.2006.01310.x.

[50] Elihimas Junior UF, Elihimas HC, Lemos VM, Leao Mde A, Sa MP, Franca EE, et al. Smoking as risk factor for chronic kidney disease: systematic review. J Bras Nefrol 2014;36:519–28. https://doi.org/10.5935/0101-2800.20140074.

[51] Nourbala MH, Nemati E, Rostami Z, Einollahi B. Impact of cigarette smoking on kidney transplant recipients: a systematic review. Iranian J Kidney Dis 2011;5:141–8.