Nephrologists’ likelihood of referring patients for kidney transplant based on hypothetical patient scenarios

Ankita Tandon1, Ming Wang2, Kevin C. Roe3, Surju Patel3 and Nasrollah Ghahramani2,3

1Department of Medicine, Pennsylvania State University College of Medicine, Hershey, PA, USA, 2Department of Public Health Sciences, Pennsylvania State University College of Medicine, Hershey, PA, USA and 3Division of Nephrology, Department of Medicine, Pennsylvania State University College of Medicine, Hershey, PA, USA

Correspondence and offprint requests to: Nasrollah Ghahramani; E-mail: nghahramani@hmc.psu.edu

Abstract

Background: There is wide variation in referral for kidney transplant and preemptive kidney transplant (PKT). Patient characteristics such as age, race, sex and geographic location have been cited as contributing factors to this disparity. We hypothesize that the characteristics of nephrologists interplay with the patients’ characteristics to influence the referral decision. In this study, we used hypothetical case scenarios to assess nephrologists’ decisions regarding transplant referral.

Methods: A total of 3180 nephrologists were invited to participate. Among those interested, 252 were randomly selected to receive a survey in which nephrologists were asked whether they would recommend transplant for the 25 hypothetical patients. Logistic regression models with single covariates and multiple covariates were used to identify patient characteristics associated with likelihood of being referred for transplant and to identify nephrologists’ characteristics associated with likelihood of referring for transplant.

Results: Of the 252 potential participants, 216 completed the survey. A nephrologist’s affiliation with an academic institution was associated with a higher likelihood of referral, and being ‘>10 years from fellowship’ was associated with lower likelihood of referring patients for transplant. Patient age <50 years was associated with higher likelihood of referral. Rural location and smoking history/chronic obstructive pulmonary disease were associated with lower likelihood of being referred for transplant. The nephrologist’s affiliation with an academic institution was associated with higher likelihood of referring for preemptive transplant, and the patient having a rural residence was associated with lower likelihood of being referred for preemptive transplant.

Conclusions: The variability in transplant referral is related to patients’ age and geographic location as well as the nephrologists’ affiliation with an academic institution and time since completion of training. Future educational interventions should emphasize the benefits of kidney transplant and PKT for all population groups regardless of geographic location and age and should target nephrologists in non-academic settings who are 10 or more years from their fellowship training.

Key words: case scenarios, disparities, kidney, preemptive, transplant
Introduction

End-stage renal disease (ESRD) is an important public health concern. It is associated with significant morbidity, cost, and years of life lost due to premature death [5]. Kidney transplantation (KT) is the treatment of choice for the majority of patients with ESRD and the most effective method to reduce morbidity and mortality. Compared with dialysis, transplantation is associated with improved survival, a better quality of life and lower costs [2, 3]. Despite the known improved outcomes, there is wide variation in the rate of referral for KT [4]. Preemptive kidney transplant (PKT) is generally associated with improved outcomes compared with KT after a period of dialysis [5]. However, most transplant candidates are referred for KT after initiation of dialysis, and PKT is underutilized as an option for patients with ESRD [6, 7].

Case scenarios

The survey contained 25 investigator-designed case scenarios, generated by reviewing literature and focus group discussions [18], and was refined following pilot testing. Nephrologists were asked whether they would recommend transplant for the 25 hypothetical patients (19 on dialysis and 6 not yet on dialysis). The scenarios for dialysis patients varied in age, race, sex, living situation (alone or with spouse), rural/urban location and smoking history/presence of chronic obstructive pulmonary disease (COPD). Scenarios for PKT did not have smoking history/COPD as a variable and age of all hypothetical patients for PKT was below 50 years.

Statistical analysis

The outcome variable for all analyses was ‘likelihood of referring for transplant’. Patient-related characteristics analyzed in the scenarios included age, race, sex, living situation (alone or with a spouse), smoking history/COPD and urban/rural location. Nephrologist-related characteristics included age, race, sex, academic affiliation, time since completion of fellowship and attendance at national nephrology meetings. Logistic regression models with single covariates and multiple covariates were used to identify patient characteristics associated with higher and lower likelihood of recommending KT and PKT and to identify characteristics of nephrologists associated with higher or lower likelihood to recommend KT and PKT. As data were clustered with two levels (observation level and nephrologist level), multilevel model was used for analysis.

Results

Of the 252 potential participants who received the questionnaire, 216 completed the survey (online: 198; paper: 18). Respondent characteristics are shown in Table 1.

Referral for KT

In univariate analysis of nephrologist-related factors, academic affiliation and urban practice were associated with higher likelihood of recommending KT; male nephrologists and ‘>10 years from fellowship’ were associated with a lower likelihood of recommending KT. In multivariate analysis, academic affiliation [odds ratio (OR): 1.64; 95% confidence interval (CI): 1.34–2.00; P < 0.005] was associated with higher likelihood of recommending transplant, and ‘>10 years from fellowship’ was associated with lower likelihood of referring patients for transplant (OR: 0.64; 95% CI: 0.53–0.78; P < 0.005) (Table 2). In univariate analysis of patient-related factors, age <50 years was associated with higher likelihood of being referred for KT. Factors associated with lower likelihood of being referred for KT included smoking.

Table 1. Characteristics of 216 respondents

| Characteristic                      | Number (Percentage) |
|------------------------------------|---------------------|
| Age, years (mean ± SD)             | 45.74 ± 9.8         |
| Age >50 years                      | 77 (36%)            |
| White                              | 123 (57%)           |
| Male                               | 182 (84%)           |
| Urban practice                     | 153 (71%)           |
| >10 years from fellowship           | 100 (46%)           |
| Academic affiliation               | 125 (58%)           |
| Attended >2 national nephrology meetings in past 5 years | 86 (40%) |

Data are presented as number and percentage in parentheses except as indicated.
Male 0.85 (0.69
White 0.29 (0.23
Living alone 0.49 (0.39
–

Rural residence 0.50 (0.39

Characteristic Single-covariate model P-value Multiple-covariate model P-value

Academic affiliation 1.60 (1.34–1.91) <0.005 1.64 (1.34–2.00) <0.005
Urban practice 1.23 (1.02–1.48) 0.03 0.93 (0.76–1.14) 0.49
Attended >2 national nephrology meetings in past 5 years 1.20 (1.00–1.44) 0.05 1.06 (0.87–1.29) 0.55
Male 0.75 (0.58–0.98) 0.03 0.80 (0.61–1.05) 0.10
>10 years from fellowship 0.73 (0.61–0.88) <0.005 0.64 (0.53–0.78) <0.005
Age >50 years 1.01 (0.83–1.21) 0.97

Data are presented as OR (95% CI). The multiple-covariate model includes only variables significant at P ≤ 0.05 in single-covariate analysis (variables: >10 years from fellowship, male sex, attended >2 national meetings in past 5 years, urban practice and academic affiliation).

Table 3. Single- and multiple-covariate OR for characteristics of 19 hypothetical dialysis patients and referral for transplant

| Characteristic | Single-covariate model | P-value | Multiple-covariate model | P-value |
|---------------|------------------------|---------|--------------------------|---------|
| Age <50 years | 2.19 (1.83–2.61)       | <0.005  | 2.32 (1.67–3.21)         | <0.005  |
| Smoking history/COPD | 0.52 (0.44–0.62) | <0.005  | 0.49 (0.35–0.68)         | <0.005  |
| Rural residence | 0.50 (0.39–0.65)       | <0.005  | 0.35 (0.25–0.50)         | <0.005  |
| Living alone | 0.49 (0.39–0.61)       | <0.005  | 0.82 (0.54–1.25)         | 0.36    |
| White | 0.29 (0.23–0.36)       | <0.005  | 1.08 (0.77–1.53)         | 0.64    |
| Male | 0.85 (0.69–1.04)       | 0.11    |                          |         |

Data are presented as OR (95% CI). The multiple-covariate model includes only variables significant at P ≤ 0.05 in single-covariate analysis (variables: White, living alone, rural residence, co-morbidity and age <50 years).

Table 4. Multiple-covariate OR for characteristics of 19 hypothetical dialysis patients and referral for transplant adjusted for nephrologist characteristics (n = 216)

| Patient characteristic | Nephrologist characteristic | Single-covariate model | P-value | Multiple-covariate model | P-value |
|------------------------|-----------------------------|------------------------|---------|--------------------------|---------|
| Age <50                | Academic affiliation        | 2.24 (1.50–3.33)       | <0.005  | 2.08 (1.42–3.05)         | <0.005  |
| Smoking history/COPD   |                             | 0.61 (0.40–0.92)       | 0.02    | 0.43 (0.29–0.62)         | <0.005  |
| Rural residence        |                             | 0.39 (0.26–0.58)       | <0.005  | 0.37 (0.25–0.54)         | <0.005  |

Data are presented as OR (95% CI). The model includes variables significant at P ≤ 0.05 in multiple-covariate analysis (variables: co-morbidity, rural residence and age <50 years) adjusted for each of the nephrologist characteristics identified as significant (variables: academic affiliation and >10 years from fellowship).

Table 2. Single- and multiple-covariate OR for nephrologist-related characteristics (n = 216) and recommendation of transplant for 19 hypothetical patients on dialysis

| Characteristic | Single-covariate model | P-value | Multiple-covariate model | P-value |
|---------------|------------------------|---------|--------------------------|---------|
| Gender        | 1.41 (1.16–1.72)       | <0.005  | 1.45 (1.18–1.77)         | <0.005  |
| Age ≤50 years | 1.97 (1.63–2.37)       | <0.005  | 2.03 (1.68–2.45)         | <0.005  |
| Attended >2 national meetings in past 5 years | 1.21 (1.02–1.44) | 0.03 | 1.06 (0.87–1.29) | 0.55 |
| Male | 0.75 (0.58–0.98) | 0.03 | 0.80 (0.61–1.05) | 0.10 |
| >10 years from fellowship | 0.73 (0.61–0.88) | <0.005 | 0.64 (0.53–0.78) | <0.005 |
| Age >50 years | 1.01 (0.83–1.21)       | 0.97    |                          |         |

Data are presented as OR (95% CI). The multiple-covariate model includes only variables significant at P ≤ 0.05 in single-covariate analysis (variables: >10 years from fellowship, male sex, attended >2 national meetings in past 5 years, urban practice and academic affiliation).

Patients on dialysis were more likely to be referred for transplant if they were male, attended >2 national meetings in past 5 years, urban practice and academic affiliation. These factors remained significant in multivariate analysis of patient-related factors, living alone was associated with higher likelihood of being referred for KT (OR: 2.61; P < 0.005) and smoking history/COPD (OR: 0.39; 95% CI: 0.24–0.63; P = 0.0001) of being referred for PKT (Table 6). This remained significant when adjusted for nephrologists’ academic affiliation (Table 7).

**Discussion**

In this scenario-based study, academic affiliation and time from fellowship are important nephrologist-related factors associated with likelihood of referring patients for transplant. Age, medical co-morbidity and rural/urban residence are important factors that affect whether or not patients would be referred for transplant. The nephrologist’s academic affiliation and the patient’s rural/urban residence are associated with likelihood of referral for preemptive transplant. We assume that these findings reflect the nephrologists’ likelihood of being current on the knowledge about benefits of KT and PKT. This study also confirms previous findings that age [25], comorbidities [26] and rural residence [11] are significant considerations in being referred for kidney transplant. Our study does not show any racial or sex difference in likelihood of being referred for transplant or preemptive transplant.
Table 5. Single- and multiple-covariate OR for nephrologist-related characteristics and recommendation of preemptive transplant for six hypothetical patients

| Characteristic                        | Single-covariate model | P-value | Multiple-covariate model | P-value |
|---------------------------------------|------------------------|---------|--------------------------|---------|
| Academic affiliation                  | 1.77 (1.23–2.55)       | 0.002   | 1.88 (1.30–2.72)         | 0.0008  |
| Age >50 years                         | 1.46 (0.96–2.20)       | 0.08    |                          |         |
| >10 years from fellowship             | 1.43 (0.99–2.06)       | 0.06    |                          |         |
| Attended >2 national nephrology meetings in past 5 years | 1.43 (0.97–2.10)       | 0.07    |                          |         |
| Urban practice                        | 0.99 (0.67–1.47)       | 0.97    |                          |         |
| Male                                  | 0.72 (0.42–1.25)       | 0.24    |                          |         |

Data are presented as OR (95% CI). The multiple-covariate model includes the only variables significant at P ≤ 0.05 in univariate analysis.

Table 6. Single- and multiple-covariate OR for characteristics of six hypothetical patients with stage 5 chronic kidney disease and referral for preemptive transplant adjusted for nephrologist characteristics

| Characteristic      | Univariate model | Multivariate model | P-value |
|---------------------|------------------|--------------------|---------|
| Living alone        | 1.48 (1.02–2.14) | 1.25 (0.80–1.96)  | 0.33    |
| Male                | 0.55 (0.38–0.81) | 0.002              | 0.69 (0.44–1.08) | 0.11 |
| Rural residence     | 0.32 (0.21–0.48) | <0.005             | 0.39 (0.24–0.63) | 0.0001 |
| White               | 0.92 (0.64–1.32) | 0.64               |         |

Data are presented as OR (95% CI). The multiple-covariate model includes only variables significant at P ≤ 0.05 in single-covariate analysis (variables: living alone, male sex and rural residence).

Table 7. Multiple-covariate OR for characteristics of six hypothetical patients with stage 5 chronic kidney disease and referral for preemptive transplant adjusted for nephrologist characteristics

| Patient characteristic | Academic affiliation | P-value |
|------------------------|----------------------|---------|
| Rural residence        | 0.23 (0.12–0.45)     | <0.005  |

Data are presented as OR (95% CI). The model includes the only variables significant at P ≤ 0.05 in multiple-covariate analysis (rural residence) adjusted for each of the nephrologist characteristics identified as significant (variables: academic affiliation and White race).

Previous studies have shown that ethnic minorities and women are less likely to be referred for KT or to be placed on the waiting list [12, 27–33]. Physicians are less likely to perceive that KT improves survival in African-American versus White patients, although acknowledging that KT improves quality of life in both groups of patients [17]. Women with ESRD are less likely to have had discussions about KT compared with men [25]. Previous studies have identified age and racial disparities in likelihood of being referred for PKT [10, 34–36]. The main limitations in our study include the response bias inherent to survey studies, and possible hypothesis guessing and social desirability bias. The latter is particularly likely in regard to the case scenarios’ race and sex. However, these biases are less likely to impact the analyses relating to the nephrologists’ demographic factors and the patients’ age, comorbidities and rural residence. The completion rate by urban nephrologists was 80.9%, while all of the rural nephrologists completed the survey. The reason for this discrepancy, which is a potential source of error, is not clear. Another limitation of the study is that only smoking history/COPD were included as comorbidities; some of the major clinically relevant comorbidities such as diabetes, ischemic heart disease and peripheral vascular disease were not included in the hypothetical scenarios.

We conclude that the substantial variability in referral for transplant and preemptive transplant among facilities might be partially related to non-medical factors, including patients’ geographic location, nephrologists’ practice setting and the amount of time since completion of training. Future interventions that address disparities in transplant should include educational activities particularly targeting nephrologists in non-academic settings who are >10 years from their training. These activities should emphasize benefits of KT and PFT for all population groups regardless of geographic location and age.

Acknowledgements

N.G. is supported by K23DK084300. The content is solely the responsibility of the author and does not necessarily represent the official views of the NIDDK or the NIH.

Conflict of interest statement

None declared.

References

1. Murray CJL, Abraham J, Ali MK et al. The state of us health, 1990–2010: Burden of diseases, injuries, and risk factors. JAMA 2013; 310: 591–608
2. Wyld M, Morton RL, Hayen A et al. A systematic review and meta-analysis of utility-based quality of life in chronic kidney disease treatments. PLoS Med 2012; 9: e1001307
3. Tonelli M, Wiebe N, Knoll G et al. Systematic review: kidney transplantation compared with dialysis in clinically relevant outcomes. Am J Transplant 2011; 11: 2093–2109
4. Patzer RE, Plantinga LC, Paul S et al. Variation in dialysis facility referral for kidney transplantation among patients with end-stage renal disease in Georgia. JAMA 2015; 314: 582–594
5. Abramowicz D, Hazzan M, Maggiore U et al. Does pre-emptive transplantation versus post start of dialysis transplantation with a kidney from a living donor improve outcomes after transplantation? A systematic literature review and position statement by the Descartes Working Group and ERBP. Nephrol Dial Transplant 2016; 31: 691–697
6. Davis CL. Preemptive transplantation and the transplant first initiative. Curr Opin Nephrol Hypertens 2010; 19: 592–597
7. Khosla N, Gordon E, Nishi L et al. Impact of a chronic kidney disease clinic on preemptive kidney transplantation and transplant wait times. Prog Transplant 2010; 20: 216–220
8. Johansen KL, Zhang R, Huang Y et al. Association of race and insurance type with delayed assessment for kidney transplantation among patients initiating dialysis in the United States. Clin J Am Soc Nephrol 2012; 7: 1490–1497
9. Delano BG, Macey L, Friedman EA. Gender and racial disparity in peritoneal dialysis patients undergoing kidney transplantation. ASAIO J 1997; 43: M861–M864
10. Grams ME, Chen BP, Coresh J et al. Preemptive deceased donor kidney transplantation: considerations of equity and utility. Clin J Am Soc Nephrol 2013; 8: 575–582
11. Axelrod DA, Guidinger MK, Finlayson S et al. Rates of solid-organ wait-listing, transplantation, and survival among residents of rural and urban areas. JAMA 2008; 299: 202–207
12. Wong LL, Kindle K, Limm B. Racial disparities in Pacific Islanders undergoing renal transplant evaluation. Hawaii Med J 2009; 68: 30–33
13. Saunders MR, Lee H, Alexander GC et al. Ethical issues in dialysis: is geography as important as race? Clin Transplant 2015; 29: 531–538
14. Schaubel DE, Stewart DE, Morrison HI et al. Sex inequality in kidney transplantation rates. Arch Intern Med 2000; 160: 2349–2354
15. Spital A, Callender CO, Miles PV. Ethical issues in dialysis: institutionalized racism and end-stage renal disease: is its impact real or illusionary? Semin Dial 2004; 17: 177–180
16. Epstein AM, Ayanian JZ, Keogh JH et al. Racial disparities in access to renal transplantation — clinically appropriate or due to underuse or overuse? N Engl J Med 2000; 343: 1537–1544
17. Ayanian JZ, Cleary PD, Keogh JH et al. Physicians’ beliefs about racial differences in referral for renal transplantation. Am J Kidney Dis 2004; 43: 350–357
18. Ghahramani N, Sanati-Mehrizi A, Wang C. Perceptions of patient candidacy for kidney transplant in the United States: a qualitative study comparing rural and urban nephrologists. Exp Clin Transplant 2014; 12: 9–14
19. Yu JI, Park HC, Ahn YC et al. Variation in practice patterns of Korean radiation oncologists for spine metastasis between 2009 and 2014. Cancer Res Treat 2015, doi: 10.4143/crt.2015.207 [Epub ahead of print]
20. Perez EA. Perceptions of prognosis, treatment, and treatment impact on prognosis in non-small cell lung cancer. Chest 1998; 114: 593–604
21. Schulman KA, Berlin JA, Harless W et al. The effect of race and sex on physicians’ recommendations for cardiac catheterization. N Engl J Med 1999; 340: 618–626
22. Rytwinski NK, Rosoff CB, Feeny NC et al. Are PTSD treatment choices and treatment beliefs related to depression symptoms and depression-relevant treatment rationales? Behav Res Ther 2014; 61: 96–104
23. Brar SS, Mahar AL, Helyer LK et al. Processes of care in the multidisciplinary treatment of gastric cancer: results of a RAND/UCLA expert panel. JAMA Surg 2014; 149: 18–25
24. Chan EW, Taylor DM, Knott JC et al. Variation in the management of hypothetical cases of acute agitation in Australasian emergency departments. Emerg Med Australas 2011; 23: 23–32
25. Salters ML, McAdams-Demarco MA, Law A et al. Age and sex disparities in discussions about kidney transplantation in adults undergoing dialysis. J Am Geriatr Soc 2014; 62: 843–849
26. Bayat S, Frimat L, Thilly N et al. Medical and non-medical determinants of access to renal transplant waiting list in a French community-based network of care. Nephrol Dial Transplant 2006; 21: 2900–2907
27. Sequist TD, Nava SA, Stiles SK et al. Access to renal transplantation among American Indians and Hispanics. Am J Kidney Dis 2004; 44: 344–352
28. Navaneethan SD, Singh S. A systematic review of barriers in access to renal transplantation among African Americans in the United States. Clin Transplant 2006; 20: 769–775
29. Young CJ, Gaston RS. African Americans and renal transplantation: disproportionate need, limited access, and impaired outcomes. Am J Med Sci 2002; 323: 94–99
30. Callender CO, Miles PV. Institutionalized racism and end-stage renal disease: is its impact real or illusionary? Semin Dial 2004; 17: 177–180
31. Thamer M, Hwang W, Fink NE et al. U.S. nephrologists’ attitudes towards renal transplantation: results from a national survey. Transplantation 2001; 71: 281–288
32. Matsuoka L, Alcubien E, Woo K et al. Kidney transplantation in the Hispanic population. Clin Transplant 2016; 30: 118–123
33. Arce CM, Goldstein BA, Mitani AA et al. Differences in access to kidney transplantation between Hispanic and non-Hispanic whites by geographic location in the United States. Clin J Am Soc Nephrol 2013; 8: 2149–2157
34. Kasiske BL, London W, Ellison MD. Race and socioeconomic factors influencing early placement on the kidney transplant waiting list. J Am Soc Nephrol 1998; 9: 2142–2147
35. Knight RJ, Teeter LD, Graviss EA et al. Barriers to preemptive renal transplantation: a single center questionnaire study. Transplantation 2015; 99: 576–579
36. Patzer RE, Sayed BA, Kutner N et al. Racial and ethnic differences in pediatric access to preemptive kidney transplantation in the United States. Am J Transplant 2013; 13: 1769–1781