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iChoose Kidney for Treatment Options: Updated Models for Shared Decision Aid

Jennifer C. Gander¹, Mohua Basu², Laura McPherson², Michael D. Garber³, Stephen O. Pastan⁴, Amita Manatunga⁵, Kimberly Jacob Arriola⁶, and Rachel E. Patzer^{2,3}

¹Center for Research and Evaluation, Kaiser Permanente Georgia, Atlanta, Georgia

²Division of Transplantation, Department of Surgery, Emory University School of Medicine, Atlanta, Georgia

³Department of Epidemiology, Rollins School of Public Health, Emory University, Atlanta, Georgia

⁴Renal Division, Department of Medicine, Emory University School of Medicine, Atlanta, Georgia

⁵Department of Biostatistics, Rollins School of Public Health, Emory University, Atlanta, Georgia

⁶Department of Behavioral Sciences and Health Education, Rollins School of Public Health, Emory University, Atlanta, Georgia

Shared patient-provider decision aids have been shown to improve patient centered care and transplant knowledge (1, 2). The iChoose Kidney shared decision aid enables healthcare providers to communicate 1- and 3- year estimated mortality risks for end stage renal disease (ESRD) patients. The shared decision aid provides mortality risks for different treatment options based on individualized patient characteristics, and increases patient knowledge of transplantation among patients evaluated for kidney transplantation in a multicenter trial (1). While the current iChoose Kidney models included patient (age, sex, race, and ethnicity) and clinical (body mass index, history of comorbidities, low albumin) characteristics, the models did not include dialysis modality despite evidence of survival differences between peritoneal dialysis, home hemodialysis, and in-center hemodialysis (3, 4), and are based on 6 years of older data (2005–2011). We aimed to update iChoose Kidney by adding dialysis modality as a predictor, and to update models with more recent, 10-year data.

Corresponding Authors: Jennifer C. Gander; Center for Research and Evaluation, Kaiser Permanente Georgia; Address: Building 11, Suite 110B, 3495 Piedmont Road NE, Atlanta, GA 30305; Telephone: (404) 364-4805; Fax: (404) 364-7361;

jennifer.c.gander@kp.org. Rachel E. Patzer; Division of Transplantation, Department of Surgery, Emory University School of Medicine, Address: 101 Woodruff Circle, Woodruff Memorial Building, Suite 5034, Atlanta, GA 30322, Telephone: 404-727-6054, repatzer@emory.edu.

Authorship

Jennifer C. Gander Participated in research design, performance of the research, data analysis, and writing the paper

Mohua Basu Participated in performance of the research, data analysis, and writing the paper

Laura McPherson Participated in performance of the research, data analysis, and writing the paper

Michael D. Garber Participated in performance of the research, data analysis, and writing the paper

Stephen O. Pastan Participated in research design, performance of the research, and writing the paper

Amita Manatunga Participated in research design, performance of the research, data analysis, and writing the paper

Kimberly Jacob Arriola Participated in research design, performance of the research, and writing the paper

Rachel E. Patzer Participated in research design, performance of the research, data analysis, and writing the paper

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Similar to previous methods (5), we used United States Renal Data System (USRDS) national surveillance data from 2005 to 2015 to create updated models. We included incident ESRD patients with dialysis start or transplant date from 2005 (n=1 371 895) through 2015 and excluded pediatric patients or patients >100 years of age (n=13 658), recipients with multiple or previous organ transplants (n=5 919), patients residing outside the US (n=20 412), and patients with unknown race (n=295) and sex (n=99). A total of 1 331 512 patients were considered for analysis and divided into 4 cohorts by treatment option: 1) dialysis (n=1 088 723), 2) transplantation (n=154 413), and the transplantation cohort was then subdivided into 3) deceased donor kidney transplantation (n=101 501), and 4) living donor kidney transplantation (n=52 844) (Figure S1). The transplant cohort included both preemptive (no dialysis) patients and dialysis patients who later received a transplant. Separate models were created for preemptive vs. non-preemptive transplant patients.

Outcomes were 1 and 3-year patient mortality due to any cause. Patient demographic variables at time of ESRD start considered for inclusion were age, sex, race, ethnicity, and insurance. Clinical factors included dialysis modality, time on dialysis, low albumin levels (<3.5 g/dL), high body mass index (>35 kg/m²) and history of diabetes, hypertension, and cardiovascular disease.

Multivariable-adjusted logistic regression was used to obtain coefficients for updated models. Predictive power and model sensitivity was determined by calculating receiver operating characteristic curve c-statistics for the updated models. Model calibration for each model was assessed through calibration plots. Sensitivity analyses were performed to 1) test model performance using the most recent 5-years of data and 2) assess the similarity in the coefficients if Cox survival analysis was used instead of logistic regression.

The final model included age, sex, race, ethnicity, dialysis modality, time on dialysis, low albumin levels (<3.5 g/dL), and history of diabetes, hypertension, and cardiovascular disease. All variables included in original models were included, with the addition of dialysis modality and a more detailed categorization for time on dialysis for the transplant cohort. Model coefficients are shown in Tables S1-S4; the models yielded good calibration and the c-statistics were similar to prior models (Table S5). The sensitivity analysis using more restricted data showed no statistically significant difference in model performance and wider confidence intervals around the c-statistic, for the majority of the models; the Cox survival analysis yielded similar coefficients as logistic regression (Table S6-S9).

Coefficients from the updated iChoose Kidney shared decision aid were similar to the previous version and yielded similar or higher predictive power. Including a more descriptive categorization of time on dialysis and distinguishing between preemptive transplant or not allows predictive models to capture additional nuances in survival; inclusion of dialysis modality recognizes the distinct patient survival differences between in-center hemodialysis, home hemodialysis, and peritoneal dialysis (3, 4). While we continue to regularly update the models found on our website (<http://ichoosekidney.emory.edu/>), future research should continue to investigate other risk factors that may enhance models' predictive power and explore extending the predictive estimate to include long-term

outcomes, while assessing the effectiveness of shared decision aids on improving patient education and access to care.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Abbreviations

ESRD	End stage renal disease
USRDS	United States Renal Data System

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