Characterization of End-Stage Kidney Disease Patients with and without Autosomal Dominant Polycystic Kidney Disease and Receiving Kidney Transplantation in the United States

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BACKGROUND & RATIONALE

- While dialysis prolongs life, kidney transplant (KTP) is the first-line treatment for patients with ESKD due to ADPKD.[1]
- Prior evidence shows patients with ADPKD are more likely waitlisted for KTP (11.7 [95% CI 11.5-12.0] per 100 person-years vs. 8.4 [8.2-8.7]) and to undergo KTP (9.8 [9.5-10.0] vs. 4.8 [4.7-5.0]), and are less likely to die (5.6 [5.4-5.7] vs. 15.5 [15.3-15.8]) than matched controls.[2]
- However, few studies characterize ADPKD patients and matched CKD controls and assess differences in inpatient resource use outcomes and risk of mortality at date of KTP.

OBJECTIVES

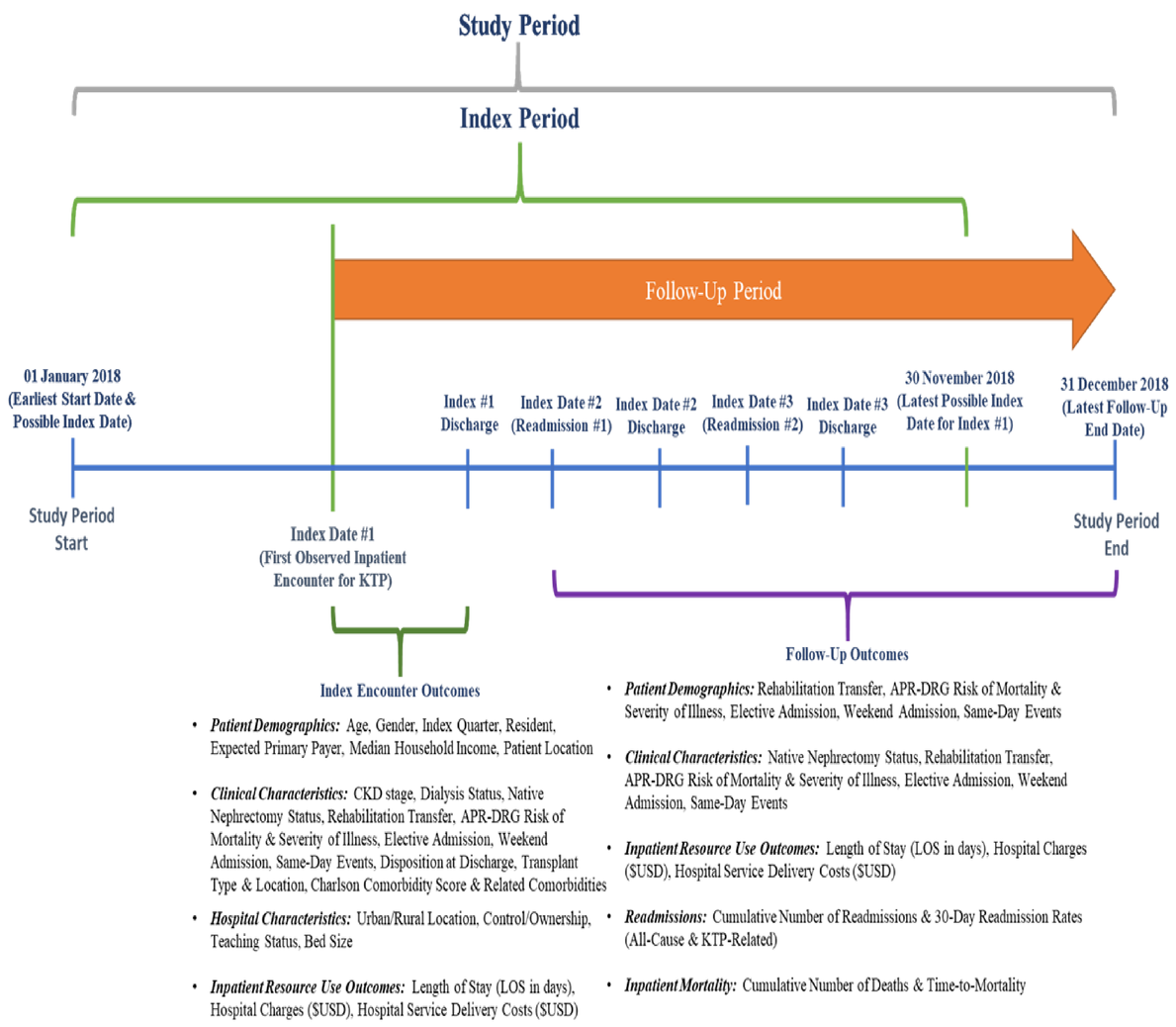
- To assess differences in patient demographics, clinical characteristics, and inpatient resource use outcomes among ADPKD cases and matched CKD controls at date of KTP (i.e., index admission).

METHODS

Retrospective Case-Cohort Design & Data Source

- A retrospective, case-cohort analysis using unweighted 2018 cross-sectional hospital discharge data from the Healthcare Cost & Utilization Project (HCUP) Nationwide Readmissions Database (Figure 1).

Figure 1. Retrospective Case Cohort Study Schematic



Sample Population

- ***Inclusion Criteria:*** Inpatients ≥18 years old at KTP with diagnosis of CKD stages 4-5 and/or ESKD. Inpatients were distinguished as cases if presence of ADPKD and/or PKD-Unspecified was observed on the index hospitalization for KTP.
- ***Exclusion Criteria:*** Inpatients were excluded if autosomal recessive polycystic kidney disease (ARPKD) diagnosis was observed, discharge occurred between 01 December 2018 and 31 December 2018, or if disposition at discharge was deceased.
- ***Random Sampling & Propensity Score Matching:*** An 11% random sample of CKD controls was obtained and a greedy 1:1 nearest neighbor match was used to pair the propensity scores of ADPKD cases to that of CKD controls. Multiple logistic regression was used to generate propensity scores of the probability inpatients were an ADPKD case (Table 1).

Descriptive Analyses

- ***Unweighted Pre-Match Data:*** Chi-square test for all nominal or ordinal binary and categorical variables. Student's t-test compared the means and Wilcoxon Rank Sum test compared the medians for continuous variables.
- ***Unweighted Post-Match Data:*** McNemar's test for all nominal binary variables. Cochran-Mantel-Haenszel test for all ordinal categorical variables. Chi-Square test for all nominal categorical variables. Paired Student's t-test compared the means and Wilcoxon signed-rank test compared the medians for all continuous variables.
- ***Hypothesis Testing:*** significance level set a priori $\alpha = 0.05$.

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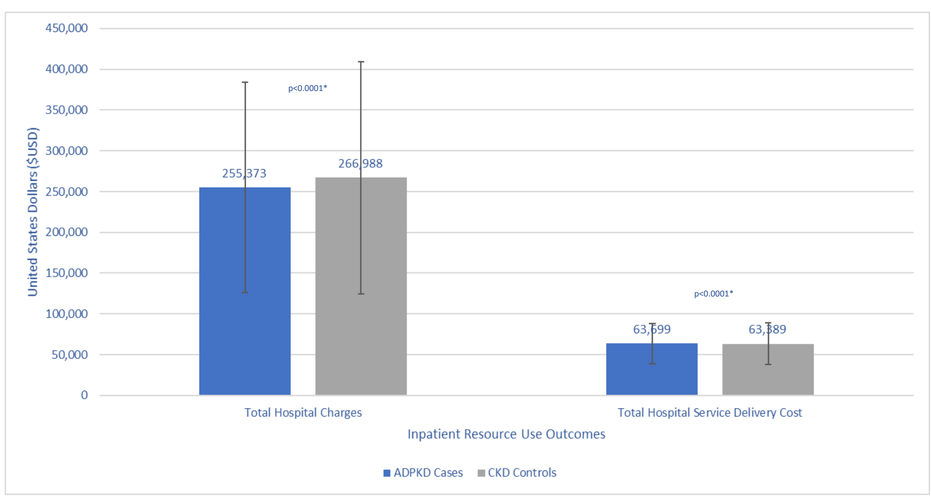
KEY POST-MATCH INDEX RESULTS

Table 1. Propensity Score Match for Likelihood the Patient is an ADPKD Case at Index Admission for KTP

Data Element	Pre-Match				Post-Match			
	Total Sample (N=1,851)	Cases (n=917)	Controls (n=934)	p value	Total Sample (N=1,544)	Cases (n=772)	Controls (n=772)	p value
Gender, n (%)								
Male	1,047 (56.56%)	461 (50.27%)	586 (62.74%)	<0.0001*	870 (56.35%)	435 (56.35%)	435 (56.35%)	0.0004*
Female	804 (43.44%)	456 (49.73%)	348 (37.26%)		674 (43.65%)	337 (43.65%)	337 (43.65%)	
Discharge Quarter, n(%)								
Q1 (January - March)	445 (24.04%)	213 (23.23%)	232 (24.84%)	0.6289	366 (23.70%)	183 (23.70%)	183 (23.70%)	1.0000
Q2 (April - June)	550 (29.71%)	273 (29.77%)	277 (29.66%)		448 (29.02%)	224 (29.02%)	224 (29.02%)	
Q3 (July - September)	504 (27.23%)	261 (28.46%)	243 (26.02%)		444 (28.76%)	222 (28.76%)	222 (28.76%)	
Q4 (October - December)	352 (19.02%)	170 (18.54%)	162 (19.49%)		286 (18.52%)	143 (18.52%)	143 (18.52%)	
APR-DRG Severity of Illness, n (%)								
Minor Loss of Function (includes no comorbidity or complications)	162 (8.75%)	107 (11.67%)	55 (5.89%)	<0.0001*	110 (7.12%)	55 (7.12%)	55 (7.12%)	1.0000
Moderate Loss of Function	861 (46.51%)	454 (49.51%)	407 (43.58%)		782 (50.65%)	391 (50.65%)	391 (50.65%)	
Major Loss of Function	756 (40.84%)	328 (35.77%)	427 (45.72%)		616 (39.90%)	308 (39.90%)	308 (39.90%)	
Extreme Loss of Function	73 (3.94%)	28 (3.05%)	45 (4.82%)		36 (2.33%)	18 (2.33%)	18 (2.33%)	
Significance= p<0.05*								

- Majority of inpatients had a moderate-to-major loss of function (50.7% and 39.9%, respectively) at index admission for KTP (Table 1).
- Majority of inpatients had ESKD (94.6%) with a higher proportion of CKD controls having ESKD (97.2% vs. 92.0%) and a higher proportion of ADPKD cases having CKD stages 4 (6.9% vs. 2.5%) and 5 (1.2% vs. 0.4%) (p<0.0001).
- Majority of inpatients were on dialysis (71.4%) with a higher proportion of ADPKD cases being dialysis naïve (37.7% vs. 19.6%) (p<0.0001).
- Majority of inpatients had a moderate-to-major likelihood of dying (77.1%) with a higher proportion of ADPKD cases having a moderate-to-major likelihood of dying (82.0% vs. 74.2%) at index admission for KTP (p=0.0018).
- Mean (SD) LOS was approximately 6 (4) days at discharge for KTP with CKD controls having a longer LOS than ADPKD cases (5.8 [4.46] vs. 5.7 [3.62]; p<0.0001).
- Mean (SD) total hospital service delivery costs were approximately $63,544 ($25,211) at discharge for KTP with ADPKD cases having higher total hospital service delivery costs than CKD controls ($63,699 [$24,617] vs. $63,389 [$25,806]; p<0.0001) (Figure 2).

Figure 2. Inpatient Total Hospital Charges and Service Delivery Cost at Index Admission for KTP



CONCLUSIONS & IMPLICATIONS

- ADPKD cases were overall healthier with shorter LOS but higher inpatient risk of mortality and higher cost of index admission for KTP than matched CKD controls.
  - Greater complexity of the transplant surgery due to enlarged native kidneys requires a more costly and higher level-of-care with longer surgical time and anesthesia exposure, thus, greater risk of inpatient mortality and resource use at date of KTP among ADPKD cases than matched CKD controls in the US.
  - All-cause 30-days readmission rate and post-KTP-related complications readmission rates and readmission resource use outcomes should be assessed among this cross-sectional cohort.
- This evidence advances our understanding of the increased burden of KTP surgical procedure among ADPKD cases than matched CKD controls and illustrates persisting unmet needs among those without access to pre-emptive KTP and/or higher quality of in-hospital KTP care as observed by the higher incidence of KTP post-dialysis exposure and hospital operating room service delivery cost.
- This evidence can be used for disease awareness with physician education regarding the need for higher-quality surgical care among those with ADPKD and receiving KTP. This evidence may also inform better allocation of healthcare resources to increase the incidence of pre-emptive KTP and/or reduce inpatient risk of mortality during or following KTP and/or reduce inpatient cost of KTP for reduced inpatient risk of mortality and cost of KTP among patients living with CKD in the US.

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