

Transition-to-Dialysis Planning, Health Care Use, and Mortality in End-Stage Renal Disease

Insiya Poonawalla, PhD, MS; Kanchan Barve, MS, MBA; Meghan Cockrell, MPH; Amal Agarwal, DO, MBA; Adrienne W. Casebeer, PhD, MS, MPP; Suzanne W. Dixon, MPH, MS, RDN; and Yong Li, PhD

Approximately 37 million individuals in the United States have chronic kidney disease (CKD),¹ and according to the Chronic Kidney Disease Surveillance System, only half of adults who are at high risk of kidney failure are aware they have the condition.² CKD is a complex condition, and adults living with it are at increased risk of poor outcomes, including cardiovascular disease (CVD), end-stage renal disease (ESRD), hospitalization, and death.³ The complexity of CKD necessitates coordinated care by a variety of health care professionals for best outcomes, including nephrologists, primary care physicians, nurses, and social workers.⁴⁻⁶ For ESRD in particular, coordinated care becomes important because dialysis treatment is burdensome to patients⁷ and financially unsustainable for the federal government over time for programs such as Medicare.⁸

Three of every 10 patients with ESRD who are 65 years and older die within a year after the start of dialysis treatment,⁹ and the costs of care for patients with kidney disease are significant. In 2018, Medicare spending for individuals with ESRD topped \$49 billion.⁸ For individuals on hemodialysis and peritoneal dialysis, per-person per-year (PPPY) Medicare spending in 2018 was \$93,191 and \$78,741, respectively, whereas Medicare Part D spending was 2.4 times higher for patients receiving dialysis (\$8173 PPPY) vs those not currently receiving dialysis treatment (\$3397 PPPY).¹⁰ Some of these dialysis care costs may be driven by the unplanned fashion in which a significant number of patients move from lower stages of CKD into dialysis care.^{11,12}

The Advancing American Kidney Health initiative was issued in 2019 by HHS to improve care delivery and outcomes for individuals with kidney disease. By 2030, the department aims to reduce the number of Americans developing ESRD by 25%.¹³ This initiative encourages more patient-centered care to reduce the risk of disease progression and kidney failure, with a focus on management of CKD and coordinated treatment of diabetes and hypertension to slow kidney function deterioration and prevent ESRD.^{14,15} Innovative care models are being employed to capitalize on the new federal initiatives around improved CKD management to prevent ESRD,¹⁶ and the National Kidney Foundation Kidney

ABSTRACT

OBJECTIVES: To evaluate the association of dialysis transition planning factors (eg, nephrologist care, vascular access placement, place of dialysis) with inpatient (IP) stays, emergency department (ED) visits, and mortality.

STUDY DESIGN: Retrospective cohort study.

METHODS: We used the Humana Research Database to identify 7026 patients with a diagnosis of end-stage renal disease (ESRD) in 2017 who were enrolled in a Medicare Advantage Prescription Drug plan with at least 12 months preindex enrollment, with first ESRD evidence as the index date. Patients with kidney transplant, hospice election, or dialysis preindex were excluded. Transition-to-dialysis planning was defined as optimal (vascular access placed), suboptimal (nephrologist care, but no vascular access), or unplanned (first dialysis in IP stay or ED visit).

RESULTS: The cohort was 41% female and 66% White, with a mean age of 70 years. Optimally planned, suboptimally planned, and unplanned transition to dialysis occurred for 15%, 34%, and 44% of the cohort, respectively. Among patients with preindex chronic kidney disease (CKD) stages 3a and 3b, 64% and 55%, respectively, had an unplanned dialysis transition. For patients with preindex CKD stages 4 and 5, 68% and 84%, respectively, had a planned transition. In adjusted models, patients with a suboptimally or optimally planned transition were 57% to 72% less likely to die, 20% to 37% less likely to experience an IP stay, and 80% to 100% more likely to experience an ED visit than patients with an unplanned dialysis transition.

CONCLUSIONS: A planned transition to dialysis was associated with reduced odds of IP stays and lower mortality.

Am J Manag Care. 2023;29(2):81-87. doi:10.37765/ajmc.2023.89316

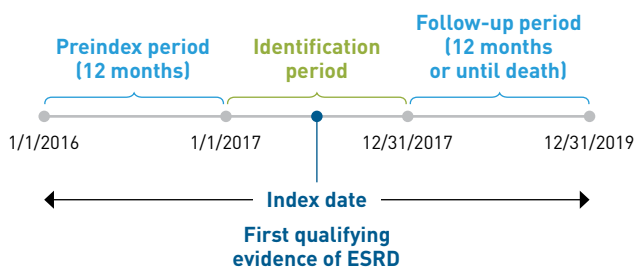
TAKEAWAY POINTS

Patients with stages 3a and 3b chronic kidney disease (CKD) were more likely to experience an unplanned transition to dialysis than individuals with advanced CKD stages 4 and 5. Individuals with earlier stages of CKD represent an important focus for policies to address this care gap, because compared with those who had an unplanned transition, patients with a suboptimally or optimally planned dialysis transition were:

- ▶ 57% to 72% less likely to die, and
- ▶ 20% to 37% less likely to experience an inpatient stay.

FIGURE 1. Study Design

Full study period: January 1, 2016, to December 31, 2019



ESRD, end-stage renal disease.

Disease Outcomes Quality Initiative (KDOQI) communicates best clinical practices for management of CKD covering key topics such as diabetes,¹⁷ hypertension,¹⁸ and dialysis vascular access.¹⁹ Despite the new coordinated care focus and improvements in managing CKD, patients do progress to ESRD, and the transition to this phase requires attention. With ESRD, a smooth transition into planned outpatient dialysis within a facility or at home is associated with better outcomes and lower cost of care.^{20,21}

Each year, approximately 130,000 Americans start dialysis,¹⁰ which highlights the need to facilitate a smooth care transition for individuals with ESRD. A well-planned transition from CKD into dialysis generally features outpatient hemodialysis using arteriovenous (AV) fistula or graft catheter placement or home-based peritoneal dialysis.²² Factors such as lack of access to a nephrologist, beginning dialysis during inpatient (IP) stays or emergency department (ED) visits, presence of CVD and other comorbidities, increased comorbidity scores, and late referrals to specialty care are associated with “crashing into” dialysis with no planning for patients with ESRD.^{21,23-25} Lack of patient awareness of their disease² and use of nephrotoxic medications in individuals with CKD²⁶ may contribute to unplanned dialysis starts as well. Crash-in patients very often require the use of temporary hemodialysis catheters and are more likely to experience negative health outcomes, such as blood infections and catheter-related complications.^{11,12,27,28}

The onset of ESRD is associated with poor outcomes and high mortality, and the role of comprehensive transition-to-dialysis planning is not well understood. Although management of CKD in conjunction with coordinated treatment of diabetes and hypertension can slow kidney function deterioration, many patients will continue on a trajectory toward eventual ESRD. In these cases, a planned transition to an outpatient facility or home dialysis is preferable to an unplanned dialysis transition

during an IP episode. This study evaluated the association between dialysis transition planning factors, including nephrologist care, vascular access placement, and place of index dialysis, and IP stays, ED visits, and mortality for patients with ESRD.

METHODS

This retrospective cohort study used the Humana Research Database to identify patients with evidence of ESRD who were aged 19 to 89 years and who were enrolled in a Medicare Advantage Prescription Drug (MAPD) plan in 2017. ESRD was identified based on evidence of at least 2 outpatient medical claims with a diagnosis for ESRD no fewer than 30 days apart but not more than 365 days apart; at least 1 IP medical claim with a diagnosis of ESRD; or at least 2 *Current Procedural Terminology (CPT)*/Healthcare Common Procedure Coding System (HCPCS), revenue, or bill type codes for receiving dialysis within 4 months of each other. Eligible patients were enrolled in the MAPD plan for at least 12 months before and after the index date of first ESRD identification (Figure 1). Patients with kidney transplant or hospice election preindex were excluded from the study population.

Transition-to-dialysis planning was established for patients who were naïve to dialysis in the 12-month preindex period. Patients were categorized into 5 groups: (1) planned optimal transition: evidence of an AV fistula/graft placement procedure in the 6 months preindex or a peritoneal dialysis catheter placement procedure in the 2 months preindex; (2) planned suboptimal transition: evidence of a nephrologist visit during the 6 months preindex but no vascular access placement; (3) unplanned transition: site of index dialysis was an IP stay or ED visit with no evidence of vascular access placement or a nephrologist visit; (4) unknown transition plan: presence of a dialysis flag but lack of evidence of vascular placement, nephrologist care, or index site of care; and (5) unknown dialysis: presence of a CMS flag for ESRD but lack of evidence of dialysis.

Outcomes

IP stay was derived from facility claims using bill type, revenue codes, and service dates during the 12-month postindex period. ED visit was identified using revenue codes, place of treatment codes, and *CPT/HCPCS* codes during the 12-month postindex

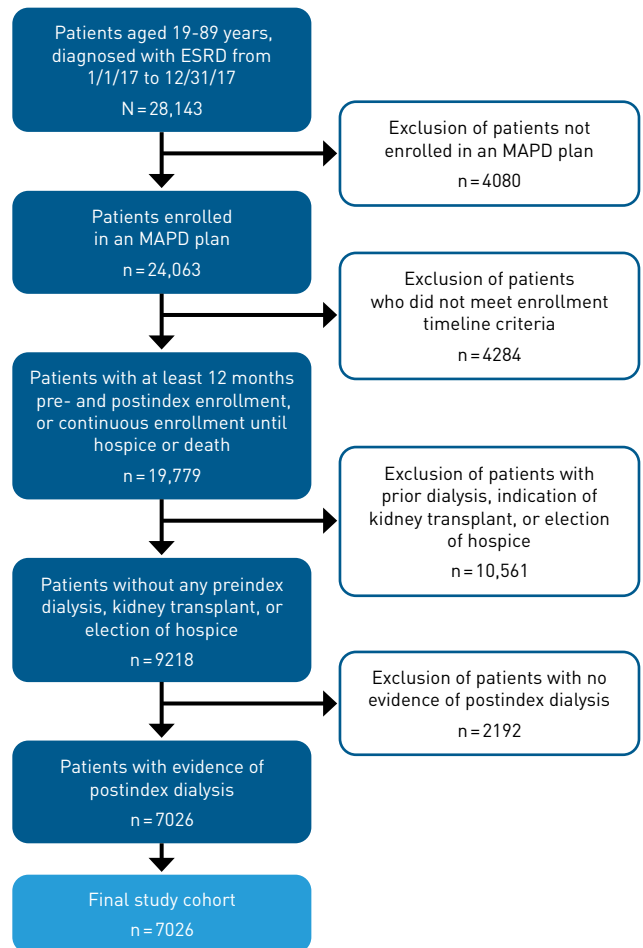
period. All-cause death and patient deceased date were identified from enrollment data.

Analysis

We calculated descriptive statistics for population characteristics, demographics, and percent of each transition-to-dialysis group experiencing mortality, inpatient stays, and ED visits. Logistic regression models were used to examine the association between transition-to-dialysis planning and study outcomes. Models controlled for baseline population characteristics and demographics including age, gender, population density (urban/suburban/rural), race, low-income subsidy (LIS)/dual Medicare-Medicaid eligibility status, and health plan type (health maintenance organization, preferred provider organization, point of service, fee for service, and other). Population density was defined as 1 of 3 categories—rural (< 10,000 people or isolated rural areas), urban ($\geq 50,000$ people), and suburban (10,000-49,999 people)—and was assigned by matching patient zip codes to rural-urban commuting area codes using the patient's zip code as of their index date.²⁹⁻³¹ Race was evaluated using the CMS database and defined as White, Black, or other. Medicare beneficiaries with income below 150% of the poverty level are flagged as LIS members in the CMS database. Any study patient with an indicator for LIS during the study period was flagged as an LIS-eligible patient for our analysis. Dual Medicare-Medicaid eligibility status was evaluated using the CMS database during the entire study period. We also controlled for Elixhauser Comorbidity Index score^{32,33} and measures of well-managed care in the 12-month preindex period. Baseline comorbidities were identified through the Elixhauser methodology, which uses 31 categories of *International Classification of Diseases, Ninth Revision* and *Tenth Revision* diagnosis codes³³ to calculate a score that is associated with hospital charges, length of stay, and mortality. Additional methodology from Klabunde et al³⁴ was used to confirm the presence of the comorbidities for inclusion in the Elixhauser score. Measures of well-managed care included hemoglobin A_{1c} (HbA_{1c}) monitoring (≥ 2 HbA_{1c} tests), adherence to glucose-lowering medications (< 60 days off therapy), adherence to CVD therapy (< 60 days off therapy), adherence to angiotensin-converting enzyme inhibitor/angiotensin receptor blocker therapy if proteinuria was present (< 60 days off therapy), and provider care (≥ 3 nephrologist visits if the patient had high renal risk [estimated glomerular filtration rate < 30 and/or albuminuria > 300 mg/g] or ≥ 2 primary care provider visits if the patient was at low renal risk). We used the Kruskal-Wallis test to assess for significant differences between transition-to-dialysis groups and median time to death.

The Humana Healthcare Research Human Subject Protection Office used the HHS regulations 45 CFR 46 and the Office of Human Research Protections Guidance on Coded Private Information or Specimens Use in Research to determine that this study did not constitute human subjects research and did not require institutional review board oversight. The decision was based on the determination that the research involved only analysis of coded information,

FIGURE 2. ESRD Cohort Attrition



ESRD, end-stage renal disease; MAPD, Medicare Advantage Prescription Drug.

and the researchers could not readily identify the individuals from whom the information was derived.

RESULTS

We identified 7026 patients with ESRD (Figure 2). The cohort was 41% female and 66% White, with a mean age of 70 years (Table 1). Optimally planned, suboptimally planned, and unplanned transitions to dialysis occurred for 15%, 34%, and 44% of the ESRD cohort, respectively. There were no significant differences in LIS or dual Medicare-Medicaid eligibility among the transition-to-dialysis groups ($P = .2995$). Among patients with preindex CKD stages 3a and 3b, 64% and 55%, respectively, had an unplanned dialysis transition. For patients with preindex CKD stages 4 and 5, 68% and 84%, respectively, experienced planning prior to dialysis initiation (Figure 3). The prevalence of baseline comorbidities varied by transition-to-dialysis start of care. Patients who had an unplanned

TABLE 1. Demographic and Clinical Characteristics of Patients With ESRD

Measures	Overall		Transition to dialysis				P
	Total ESRD cohort	Unplanned	Planned suboptimal	Planned optimal	Unknown transition	Unknown dialysis	
N	7026	3079	2418	1035	291	203	
Age in years, mean (SD)	70.39 (9.66)	70.48 (9.58)	71.16 (9.57)	69.87 (9.10)	68.55 (10.97)	65.30 (10.75)	<.0001
Age in years, n (%)							<.0001
19-44	107 (1.5)	42 (1.4)	35 (1.4)	12 (1.2)	11 (3.8)	7 (3.4)	
45-54	321 (4.6)	142 (4.6)	87 (3.6)	53 (5.1)	19 (6.5)	20 (9.9)	
55-64	1158 (16.5)	497 (16.1)	369 (15.3)	174 (16.8)	60 (20.6)	58 (28.6)	
65-74	2984 (42.5)	1315 (42.7)	1003 (41.5)	476 (46.0)	112 (38.5)	78 (38.4)	
75-89	2456 (35.0)	1083 (35.2)	924 (38.2)	320 (30.9)	89 (30.6)	40 (19.7)	
Female, n (%)	2852 (40.6)	1165 (37.8)	1068 (44.2)	453 (43.8)	104 (35.7)	62 (30.5)	<.0001
Geographic region, n (%)							.0001
Northeast	196 (2.8)	99 (3.2)	52 (2.2)	29 (2.8)	13 (4.5)	3 (1.5)	
Midwest	1431 (20.4)	684 (22.2)	434 (17.9)	214 (20.7)	67 (23.0)	32 (15.8)	
South	4744 (67.5)	2011 (65.3)	1721 (71.2)	691 (66.8)	179 (61.5)	142 (70.0)	
West	655 (9.3)	285 (9.3)	211 (8.7)	101 (9.8)	32 (11.0)	26 (12.8)	
Race, n (%)							<.0001
White	4618 (65.7)	2180 (70.8)	1480 (61.2)	663 (64.1)	172 (59.1)	123 (60.6)	
Black	1950 (27.8)	730 (23.7)	768 (31.8)	298 (28.8)	93 (32.0)	61 (30.0)	
Hispanic	394 (5.6)	139 (4.5)	150 (6.2)	64 (6.2)	23 (7.9)	18 (8.9)	
Other/unknown	64 (0.9)	30 (1.0)	20 (0.8)	10 (1.0)	3 (1.0)	1 (0.5)	
Low-income subsidy or dual eligibility, n (%)	2795 (39.8)	1196 (38.8)	978 (40.4)	417 (40.3)	129 (44.3)	75 (36.9)	.2995
Elixhauser Comorbidity Index score, mean (SD)	8.30 (3.39)	8.58 (3.37)	8.81 (3.13)	7.80 (3.04)	4.77 (4.03)	5.71 (3.01)	<.0001
Elixhauser Comorbidity Index conditions, n (%)							
Congestive heart failure	3895 (55.4)	1792 (58.2)	1477 (61.1)	475 (45.9)	91 (31.3)	60 (29.6)	<.0001
Hypertension (uncomplicated) ^a	6046 (86.1)	2552 (82.9)	2239 (92.6)	931 (90.0)	163 (56.0)	161 (79.3)	<.0001
Hypertension (complicated) ^b	5352 (76.2)	2005 (65.1)	2197 (90.9)	874 (84.4)	142 (48.8)	134 (66.0)	<.0001
Diabetes (uncomplicated) ^c	3957 (56.3)	1571 (51.0)	1520 (62.9)	645 (62.3)	113 (38.8)	108 (53.2)	<.0001
Diabetes (complicated) ^d	4253 (60.5)	1606 (52.2)	1696 (70.1)	716 (69.2)	130 (44.7)	105 (51.7)	<.0001
Neurological disorders	1875 (26.7)	1208 (39.2)	493 (20.4)	144 (13.9)	14 (4.8)	16 (7.9)	<.0001
COPD	2377 (33.8)	1204 (39.1)	791 (32.7)	286 (27.6)	67 (23.0)	29 (14.3)	<.0001
Fluid electrolyte disorders	4758 (67.7)	2323 (75.4)	1679 (69.4)	611 (59)	88 (30.2)	57 (28.1)	<.0001
Liver failure	1033 (14.7)	674 (21.9)	237 (9.8)	96 (9.3)	13 (4.5)	13 (6.4)	<.0001
Coagulopathy	1290 (18.4)	765 (24.8)	392 (16.2)	109 (10.5)	13 (4.5)	11 (5.4)	<.0001
Preindex inpatient admissions, n (%)	5423 (77.2)	2843 (92.3)	1815 (75.1)	583 (56.3)	99 (34.0)	83 (40.9)	<.0001
Preindex indicators of poor disease management, n (%)							
Lack of adequate HbA _{1c} monitoring ^{e,f}	1156 (24.6)	570 (30.2)	331 (18.6)	155 (20.4)	61 (42.4)	39 (30.5)	<.0001
Glucose-lowering therapy nonadherence ^{e,f}	2405 (51.2)	894 (47.4)	970 (54.6)	436 (57.4)	55 (38.2)	50 (39.1)	<.0001
CVD therapy nonadherence ^{e,f}	1699 (26.0)	904 (32.5)	483 (20.3)	226 (22.6)	49 (25.8)	37 (20.4)	<.0001
ACE inhibitor/ARB therapy nonadherence ^{e,f}	944 (42.4)	190 (47.0)	492 (41.9)	231 (41.8)	18 (31.6)	13 (34.2)	<.0001
Lack of adequate nephrologist or PCP visits ^e	1798 (25.6)	958 (31.1)	409 (16.9)	179 (17.3)	180 (61.9)	72 (35.5)	<.0001

ACE, angiotensin-converting enzyme; ARB, angiotensin receptor blocker; CKD, chronic kidney disease; COPD, chronic obstructive pulmonary disease; CVD, cardiovascular disease; ESRD, end-stage renal disease; HbA_{1c}, hemoglobin A_{1c}; PCP, primary care provider.

^aUncomplicated hypertension: essential (primary) hypertension.

^bComplicated hypertension: hypertensive heart disease, hypertensive CKD, hypertensive heart disease and CKD, or secondary hypertension.

^cUncomplicated diabetes: diabetes with ketoacidosis or with hyperosmolarity or without a mention of complication.

^dComplicated diabetes: diabetes with renal manifestations, ophthalmic complications, neurological complications, circulatory complications, or other specified/unspecified complications.

^eMeasured in the 12-month preindex period.

^fPercentages were calculated among those eligible for measurement.

transition to dialysis had a higher prevalence of fluid electrolyte disorders (unplanned vs suboptimally planned vs optimally planned, 75.4% vs 69.4% vs 59.0%, respectively; $P < .0001$), neurological disorders (39.2% vs 20.4% vs 13.9%; $P < .0001$), liver failure (21.9% vs 9.8% vs 9.3%; $P < .0001$), coagulopathy (24.8% vs 16.2% vs 10.5%; $P < .0001$), and chronic obstructive pulmonary disease (39.1% vs 32.7% vs 27.6%; $P < .0001$). Conversely, patients who had an optimally or suboptimally planned transition to dialysis had a higher prevalence of uncomplicated diabetes (62.3% vs 62.9% vs 51.0%; $P < .0001$), complicated diabetes (69.2% vs 70.1% vs 52.2%; $P < .0001$), uncomplicated hypertension (90.0% vs 92.6% vs 82.9%; $P < .0001$), and complicated hypertension (84.4% vs 90.0% vs 65.1%; $P < .0001$) than those who had an unplanned transition, respectively (Table 1).

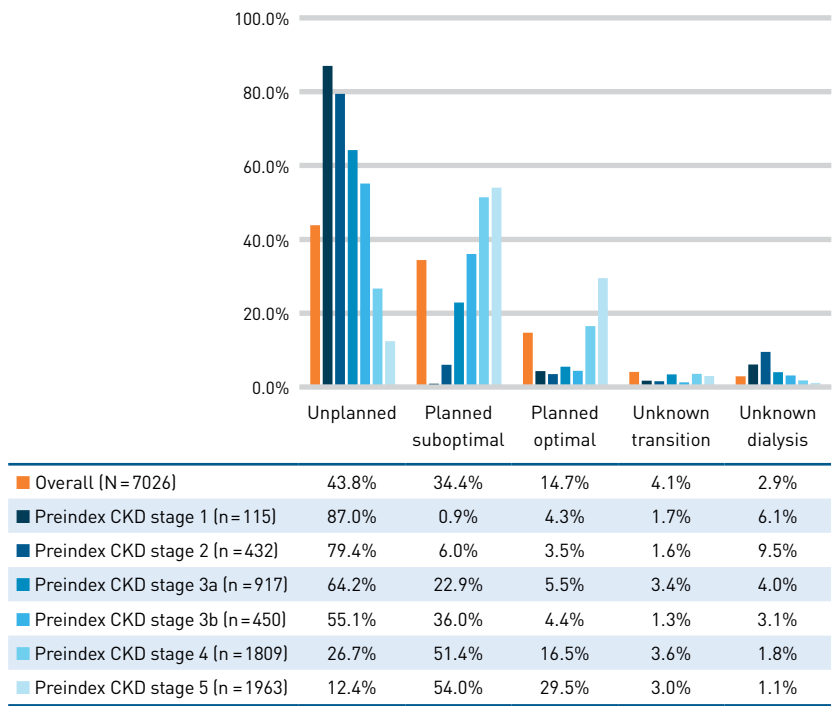
Postindex outcomes were significantly different across the 3 transition-to-dialysis groups. In patients with a planned optimal transition to dialysis, 71.1% experienced an IP stay, 79.0% had an ED visit, and 19.5% died. For individuals with a suboptimally planned transition to dialysis, 77.3% had an IP stay, 76.6% had an ED visit, and 31.1% died. For patients with an unplanned transition, 82.5% experienced an IP stay, 58.5% had an ED visit, and 57.3% died (Table 2).

In adjusted models, patients with an optimally planned transition to dialysis were 72% less likely to die ($P < .0001$), 37% less likely to experience an IP stay ($P < .0001$), and 100% more likely to experience an ED visit ($P < .0001$) than patients with an unplanned transition. Patients with a suboptimally planned transition to dialysis were 57% less likely to die ($P < .0001$), 20% less likely to experience an IP stay ($P = .0065$), and 80% more likely to experience an ED visit ($P < .0001$) than patients with an unplanned transition (Table 2). In the optimally planned, suboptimally planned, and unplanned transition-to-dialysis groups, the median (IQR) time to death in days was 95 (19-225), 60 (21-180), and 31 (13-87), respectively ($P < .0001$).

DISCUSSION

In this real-world study, we found that patients with CKD who had a planned transition to dialysis had longer survival and lower rates of IP admissions. Despite potential benefits, a significant portion of patients with CKD do not experience coordinated planning for

FIGURE 3. Dialysis Start of Care, by Last Measured CKD Stage Preindex



CKD, chronic kidney disease.

TABLE 2. Impact of Transition-to-Dialysis Planning on Health Care Resource Utilization and Mortality*

Transition to dialysis	Postindex outcomes		
	Mortality	Inpatient stay	Emergency department visit
Planned optimal	19.5%	71.1%	79.0%
Planned suboptimal	31.1%	77.3%	76.6%
Unplanned	57.3%	82.5%	58.5%
Odds ratio (95% CI); P value			
Planned optimal vs unplanned	0.281 (0.232-0.342); $P < .0001$	0.631 (0.522-0.763); $P < .0001$	2.005 (1.662-2.418); $P < .0001$
Planned suboptimal vs unplanned	0.434 (0.377-0.500); $P < .0001$	0.800 (0.682-0.940); $P = .0065$	1.799 (1.561-2.075); $P < .0001$

*All models control for age, gender, region, population density, race, low-income subsidy and/or dual eligibility, plan type, Elixhauser Comorbidity Index score, and well-managed care.

a transition to dialysis. For example, a retrospective analysis of 192,307 patients initiating hemodialysis reported small percentages of patients meeting specific KDOQI goals of (1) use of AV fistula or graft at initiation, (2) hemoglobin level of 11 g/dL or greater, and (3) albumin level at goal. Only 1.6% of patients met all 3 of these goals, whereas 59% of the study population met 0 goals, 31% met 1, and 9% met 2. Meeting fewer goals predicted higher mortality post dialysis initiation.³⁵ Failure to meet clinical benchmarks may point to care gaps leading to an unplanned dialysis transition.

Programs designed around meeting specific clinical targets will likely require regular clinical care to facilitate a planned transition. Our data demonstrate that routine provider care prior to dialysis is associated with better outcomes, further bolstering the case for policies and programs to meet specific ESRD care quality goals such as those identified by KDOQI. In the Dialysis Outcomes and Practice Patterns Study (DOPPS) examining CKD care and outcomes, an evaluation of 8500 patients newly initiating hemodialysis in Japan showed that predialysis nephrologist visits were associated with a 43% lower risk for death in the first year after start of dialysis.³⁶ Our analysis, which showed that even a suboptimally planned transition consisting of engaging in primary care and nephrology visits without vascular access placement in the predialysis period is associated with better outcomes, aligns with the DOPPS mortality data. In fact, we observed increasing mortality when moving from optimally planned (19.5%) to suboptimally planned (31.1%) to unplanned (57.3%) dialysis transition, adding to this body of evidence on the documented negative effects of gaps in ESRD care.

The application of emerging data, new methodologies, and modeling techniques suggest that efficient and effective dialysis transition programs can be designed.^{37,38} Evidence from smaller programs implementing these ideas suggests that patients with ESRD are likely to benefit from a more carefully planned transition to dialysis.^{22,39,40} For example, a transitional dialysis care unit is an innovative 3- to 6-week program designed for patients newly initiating hemodialysis. It is structured to address several elements including physical and psychosocial well-being of the patient, providing tailored education, peer support, and care coordination with other teams. Although these programs are still in the early stages of large-scale implementation, growth in this area and the importance of enhanced communication among patients and providers remain priorities.⁴¹

Despite the clear value in planning a transition to prevent a crash into dialysis, there was a significant gap in the number of patients who had an optimal transition to dialysis. Only 15% of patients in our cohort had an optimally planned transition to dialysis, whereas 34% experienced a suboptimally planned transition and 44% had an unplanned start to dialysis. This aligns with other retrospective data, which, from a KDOQI goal-driven perspective, demonstrate that a large majority of patients (59%) do not meet many of the predefined goals in the dialysis transition period that are linked with better outcomes.³⁵

In the present study, we were able to define which patients, by stage, were more likely to crash into dialysis without planning, adding to an understanding of where targeted programs to address transition to dialysis may be more impactful. We found that patients with early-stage CKD (stages 1-3b) most commonly had an unplanned transition to dialysis, presenting an opportunity for interventions to initiate dialysis planning earlier in patients with lower stages of disease. Conversely, patients with advanced CKD (stages 4-5) were more likely to have a planned transition to dialysis, which may be due to a higher disease awareness in this population. Kidney Care

Choices (KCC), a program that supports these patients, encompasses dialysis facilities, nephrologists, and other health care providers who form ESRD-focused accountable care organizations, with a focus on Medicare beneficiaries with CKD stages 4 and 5 and ESRD.⁴² Our data suggest there may be benefit to extending programs such as KCC to patients with earlier-stage disease as well.

The 2019 Advancing American Kidney Health initiative encourages more patient-centered care and coordinated treatment of diabetes and hypertension to slow kidney function deterioration. Our finding of more prevalent diabetes and hypertension in those who experienced a planned transition to dialysis suggests the possibility that coordinated care efforts for CKD have resulted in better transition planning for the higher-risk patients with these comorbid conditions. Additionally, because many of these patients have progressed to CKD stages 4 and 5, they already may be receiving care coordination due to their advanced disease stage. The KCC program is an example of how patients with CKD stages 4 and 5 are a focus of efforts to address care gaps in the dialysis transition period. However, patients with stages 3a and 3b kidney disease are also likely to benefit from similar care coordination and disease management interventions. These findings may inform ongoing and future models of ESRD care coordination^{43,44} with the goal of a fully planned, well-coordinated transition to dialysis reaching all patients with CKD rather than only those readily identified as needing dialysis in the near future due to advanced disease stage.

Limitations

We did not adjust for the effect of time to mortality on health care resource use. A higher ED utilization observed with planned transition could be attributed to longer time to mortality, allowing more time for health care utilization. This effect may have impacted IP stays as well, such that those in the planned transition group had longer time to mortality and more opportunity for IP stays. Due to this, our observation of a reduced likelihood of IP stays in this group may be an underestimate of the magnitude of the association between a planned dialysis transition and reduced rates of IP stays. Additional limitations common to studies using administrative claims data apply to this study as well, including errors in claims' coding and lack of availability of certain clinical information (eg, granular medical history). This missing, incomplete, or inaccurate data within the health care information technology system poses a limitation to the use of secondary data. Inability to adjust outcomes models for clinical measures dependent on laboratory data (such as estimated glomerular filtration rate and urine albumin to creatinine ratio) can contribute to residual confounding. No causal inference can be ascertained from this study, as it was an observational design using retrospective claims data. This study utilized data for the Humana MAPD member population only, so the results may not be generalizable to the overall US population. However, Humana is a large national health plan with members residing in a broad array of geographic regions.

CONCLUSIONS

The longer survival and reduced odds of an IP stay among patients with a suboptimally or optimally planned transition to dialysis support the importance of more intentional care planning for individuals with CKD. We found that patients with early-stage CKD (stages 1-3b) most commonly had an unplanned transition, which suggests a potential lack of awareness around the need to plan for dialysis earlier in the CKD trajectory. Programs to educate patients and providers on potential benefits of transition-to-dialysis planning may yield important benefits for patient outcomes and reduced health care resource utilization. Future directions for research should include a focus on which policies improve access to predialysis care planning for the greatest number of patients. ■

Author Affiliations: Humana Healthcare Research, Humana Inc (IP, SWD, YL), Louisville, KY; Humana Inc (KB, MC, AA, AWC), Louisville, KY; now with CVS Health (MC), Woonsocket, RI; now with Monogram Health (AA), Brentwood, TN.

Source of Funding: Humana Healthcare Research funded the research and manuscript development. No external funds were used in the creation of this work.

Author Disclosures: Ms Cockrell was employed by and owned stock in Humana at the time of this work. The remaining authors report no relationship or financial interest with any entity that would pose a conflict of interest with the subject matter of this article.

Authorship Information: Concept and design (IP, KB, MC, AA, AWC, YL); acquisition of data (YL); analysis and interpretation of data (IP, KB, MC, AA, AWC, SWD, YL); drafting of the manuscript (IP, MC, AA, SWD); critical revision of the manuscript for important intellectual content (IP, KB, MC, AA, AWC, SWD, YL); statistical analysis (KB, YL); administrative, technical, or logistic support (IP, MC, SWD); and supervision (IP, KB).

Address Correspondence to: Insiya Poonawalla, PhD, MS, Humana Healthcare Research Inc, 500 W Main St, Louisville, KY 40202. Email: ipoonawalla@humana.com.

REFERENCES

- Chronic kidney disease in the United States, 2021. CDC. March 4, 2021. Accessed April 12, 2022. <https://www.cdc.gov/kidneydisease/pdf/Chronic-Kidney-Disease-in-the-US-2021-h.pdf>
- Only half of adults at high risk of kidney failure know they have CKD. CDC. July 2021. Accessed April 14, 2022. https://nccd.cdc.gov/ckd/AreYouAware.aspx?emailDate=July_2021
- Effective health care: care coordination strategies for chronic kidney disease: nomination summary document. Agency for Healthcare Research and Quality. May 25, 2015. Accessed April 13, 2022. <https://effectivehealthcare.ahrq.gov/sites/default/files/pdf/TND-0547-151012.pdf>
- Johnson DS, Meyer KB. Integrated care for people with kidney disease: the perspective of a nonprofit dialysis provider. *Clin J Am Soc Nephrol*. 2019;14(3):448-450. doi:10.2215/CJN.13641118
- Evans JM, Wheeler SM, Sati S, Gradin S, MacKinnon M, Blake PG. Assessing the delivery of coordinated care to patients with advanced chronic kidney disease in Ontario, Canada: a survey of patients and healthcare professionals. *Int J Integr Care*. 2021;21(2):30. doi:10.5334/ijic.5587
- Vassalotti JA, Boucree SC. Integrating CKD into US primary care: bridging the knowledge and implementation gaps. *Kidney Int Rep*. 2022;7(3):389-396. doi:10.1016/j.ekir.2022.01.1066
- Rohrer G. Care coordination fixes one of the biggest flaws in the American health care system. Dialysis Patient Citizens Education Center. July 6, 2020. Accessed April 13, 2022. <https://www.dpcedcenter.org/news-events/news/care-coordination-fixes-one-of-the-biggest-flaws-in-the-american-health-care-system/>
- Kidney disease statistics for the United States. National Institute of Diabetes and Digestive and Kidney Diseases. September 2021. Accessed April 13, 2022. <https://www.niddk.nih.gov/health-information/health-statistics/kidney-disease>
- Wachterman MW, O'Hare AM, Rahman OK, et al. One-year mortality after dialysis initiation among older adults. *JAMA Intern Med*. 2019;179(7):987-990. doi:10.1001/jamainternmed.2019.0125
- Kidney disease: the basics. National Kidney Foundation. Accessed April 25, 2022. <https://www.kidney.org/newsroom/fstindex>
- Bhalla NM, Arora N, Darbinian JA, Zheng S. Urgent start peritoneal dialysis: a population-based cohort study. *Kidney Med*. 2022;4(3):1004-14. doi:10.1016/j.xkme.2022.100414
- Liang X, Liu Y, Chen B, et al. Central venous disease increases the risk of microbial colonization in hemodialysis catheters. *Front Med (Lausanne)*. 2021;8:645539. doi:10.3389/fmed.2021.645539
- Advancing American Kidney Health. HHS. 2018. Accessed April 14, 2022. <https://aspe.hhs.gov/system/files/pdf/262046/AdvancingAmericanKidneyHealth.pdf>

- DP18-1817: innovative state and local public health strategies to prevent and manage diabetes, heart disease, and stroke. CDC. Updated December 9, 2022. Accessed January 8, 2023. <https://www.cdc.gov/diabetes/programs/stateandlocal/funded-programs/dp18-1817.html>
- Vassalotti JA, Centor R, Turner BJ, Greer RC, Choi M, Sequist TD; National Kidney Foundation Kidney Disease Outcomes Quality Initiative. Practical approach to detection and management of chronic kidney disease for the primary care clinician. *Am J Med*. 2016;129(2):153-162.e7. doi:10.1016/j.amjmed.2015.08.025
- Jain G, Weiner DE. Value-based care in nephrology: the kidney care choices model and other reforms. *Kidney360*. 2021;2(10):1677-1683. doi:10.34067/KID.0004552021
- Mottl AK, Alicic R, Argyropoulos C, et al. KDOQI US commentary on the KDIGO 2020 clinical practice guideline for diabetes management in CKD. *Am J Kidney Dis*. 2022;79(4):457-479. doi:10.1053/j.ajkd.2021.09.010
- Drawz PE, Beddhu S, Bignal ONR II, et al. KDOQI US commentary on the 2021 KDIGO clinical practice guideline for the management of blood pressure in CKD. *Am J Kidney Dis*. 2022;79(3):311-327. doi:10.1053/j.ajkd.2021.09.013
- Lok CE, Huber TS, Lee T, et al; National Kidney Foundation. KDOQI clinical practice guideline for vascular access: 2019 update. *Am J Kidney Dis*. 2020;75(4 suppl 2):S1-S164. doi:10.1053/j.ajkd.2019.12.001
- Kurella Tamura M, Desai M, Kappahnn KI, Thomas IC, Asch SM, Chertow GM. Dialysis versus medical management at different ages and levels of kidney function in veterans with advanced CKD. *J Am Soc Nephrol*. 2018;29(8):2169-2177. doi:10.1681/ASN.2017121273
- Molnar AO, Hiremath S, Brown PA, Akbari A. Risk factors for unplanned and crash dialysis starts: a protocol for a systematic review and meta-analysis. *Syst Rev*. 2016;5(1):117. doi:10.1186/s13643-016-0297-2
- Schaeffner E. Smoothing transition to dialysis to improve early outcomes after dialysis initiation among old and frail adults—a narrative review. *Nephrol Dial Transplant*. 2022;37(12):2307-2313. doi:10.1093/ndt/gfab342
- Hassan R, Akbari A, Brown PA, Hiremath S, Brimble KS, Molnar AO. Risk factors for unplanned dialysis initiation: a systematic review of the literature. *Can J Kidney Health Dis*. 2019;6:2054358119831684. doi:10.1177/2054358119831684
- Chiu K, Alam A, Iqbal S. Predictors of suboptimal and crash initiation of dialysis at two tertiary care centers. *Hemodial Int*. 2012;16(suppl 1):S39-S46. doi:10.1111/j.1542-4758.2012.00744.x
- Brown PA, Akbari A, Molnar AO, et al. Factors associated with unplanned dialysis starts in patients followed by nephrologists: a retrospective cohort study. *PLoS One*. 2015;10(6):e0130080. doi:10.1371/journal.pone.0130080
- Bosi A, Xu Y, Gasparini A, et al. Use of nephrotoxic medications in adults with chronic kidney disease in Swedish and US routine care. *Clin Kidney J*. 2022;15(3):442-451. doi:10.1093/ckj/sfab210
- Xue H, Ix JH, Wang W, et al. Hemodialysis access usage patterns in the incident dialysis year and associated catheter-related complications. *Am J Kidney Dis*. 2013;61(1):123-130. doi:10.1053/j.ajkd.2012.09.006
- Arhuidese IJ, Orandi BJ, Nejim B, Malas M. Utilization, patency, and complications associated with vascular access for hemodialysis in the United States. *J Vasc Surg*. 2018;68(4):1166-1174. doi:10.1016/j.jvs.2018.01.049
- Hart LG, Larson EH, Lishner DM. Rural definitions for health policy and research. *Am J Public Health*. 2005;95(7):1149-1155. doi:10.2105/AJPH.2004.042432
- Rural-urban commuting area codes. United States Department of Agriculture. August 17, 2020. Accessed September 26, 2022. <https://www.ers.usda.gov/data-products/rural-urban-commuting-area-codes/>
- Documentation: 2010 rural-urban commuting area (RUCA) codes. United States Department of Agriculture. August 17, 2020. Accessed September 26, 2022. <https://www.ers.usda.gov/data-products/rural-urban-commuting-area-codes/documentation/>
- Elixhauser A, Steiner C, Harris DR, Coffey RM. Comorbidity measures for use with administrative data. *Med Care*. 1998;36(11):8-27. doi:10.1097/00005650-199801000-00004
- Quan H, Sundararajan V, Halfon P, et al. Coding algorithms for defining comorbidities in ICD-9-CM and ICD-10 administrative data. *Med Care*. 2005;43(11):1130-1139. doi:10.1097/01.mlr.0000182534.19832.83
- Klabunde CN, Potosky AL, Legler JM, Warren JL. Development of a comorbidity index using physician claims data. *J Clin Epidemiol*. 2000;53(12):1258-1267. doi:10.1016/s0895-4356(00)00256-0
- Stinin Y, Guo H, Gilbertson DT, et al. Meeting KDOQI guideline goals at hemodialysis initiation and survival during the first year. *Clin J Am Soc Nephrol*. 2010;5(9):1574-1581. doi:10.2215/CJN.01320210
- Hasegawa T, Bragg-Gresham JL, Yamazaki S, et al. Greater first-year survival on hemodialysis in facilities in which patients are provided earlier and more frequent pre-nephrology visits. *Clin J Am Soc Nephrol*. 2009;4(3):595-602. doi:10.2215/CJN.03540708
- Kalantar-Zadeh K, Kovessy CP, Streja E, et al. Transition of care from pre-dialysis prelude to renal replacement therapy: the blueprints of emerging research in advanced chronic kidney disease. *Nephrol Dial Transplant*. 2017;32(suppl 2):ii91-ii98. doi:10.1093/ndt/gfw357
- Couchoud CG, Beuscart JB, Aldigier JC, Brunet P, Moranne OP; REIN Registry. Development of a risk stratification algorithm to improve patient-centered care and decision making for incident elderly patients with end-stage renal disease. *Kidney Int*. 2015;88(5):1178-1186. doi:10.1038/ki.2015.245
- Morfin JA, Yang A, Wang E, Schiller B. Transitional dialysis care units: a new approach to increase home dialysis modality uptake and patient outcomes. *Semin Dial*. 2018;31(1):82-87. doi:10.1111/sdi.12651
- Bowman B, Zheng S, Yang A, et al. Improving incident ESRD care via a transitional care unit. *Am J Kidney Dis*. 2018;72(2):278-283. doi:10.1053/j.ajkd.2018.01.035
- Manns B, Hemmelgarn B, Lillie E, et al. Setting research priorities for patients on or nearing dialysis. *Clin J Am Soc Nephrol*. 2014;9(10):1813-1821. doi:10.2215/CJN.01610214
- Kidney Care Choices (KCC) model. CMS. Updated December 9, 2022. Accessed January 9, 2023. <https://innovation.cms.gov/innovation-models/kidney-care-choices-kcc-model>
- Murphy E, Burns A, Murtagh FEM, Rooshenas L, Caskey EJ. The Prepare for Kidney Care Study: prepare for renal dialysis versus responsive management in advanced chronic kidney disease. *Nephrol Dial Transplant*. 2021;36(6):975-982. doi:10.1093/ndt/gfab209
- O'Hare AM, Armistead N, Schrag WL, Diamond L, Moss AH. Patient-centered care: an opportunity to accomplish the "three aims" of the National Quality Strategy in the Medicare ESRD program. *Clin J Am Soc Nephrol*. 2014;9(12):2189-2194. doi:10.2215/CJN.01930214

Visit ajmc.com/link/89316 to download PDF