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Miracle Ephraim April 3, 2025

Exploring the impact of state-based variation in Medicaid managed care administration on evaluation rates among patients seeking kidney transplant

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Abstract

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By Miracle Ephraim

Background & Aim: Individuals with end-stage kidney disease (ESKD) who receive Medicaid insurance coverage are less likely to be waitlisted for or receive a transplant as compared with those enrolled in other insurance programs. Whether state-level Medicaid policies further impact access is unknown. Therefore, in this study, we explore whether a state's mode of Medicaid administration is associated with rates of starting the medical evaluation for transplant among Medicaid enrollees with ESKD.

Methods: We identified all adults (aged 18-80 years) with ESKD referred to one of 37 transplant centers in the Early Steps to Transplant Registry between January 2015 and December 2020, with follow-up through 2021. We restricted our sample to those receiving Medicaid coverage (n=12,226). Our primary outcome was evaluation within six months of first referral date. Using multivariable logistic regression, we examined the association between state's mode of Medicaid administration (mandatory managed care organization (MCO) enrollment, voluntary MCO enrollment, or state fee-for-service (FFS) program) and the likelihood of evaluation adjusting for several patient and neighborhood-level characteristics.

Results: Among our study population, median age was 50 years old (IQR: 38-59), 47.6% were women, and 51.5% identified as non-Hispanic Black. 65.1%, 26.5%, and 8.4% were enrolled in mandatory MCO, voluntary MCO, and FFS, respectively. In total, 5,995 (49.0%) were evaluated within 6-months of referral, including 40.8% of mandatory MCO, 64.7% of voluntary MCO, and 63.2% of FFS. ESKD adults covered by Medicaid in states with voluntary MCO and FFS programs were 25% (adjusted odds ratio (aOR) = 1.25, [95% CI: 1.05, 1.45]) and 92% (aOR = 1.77, [1.49, 2.12]) more likely to be evaluated within 6 months as compared with mandatory MCO, respectively.

Conclusion: Mode of Medicaid managed care administration appears to impact rates of evaluation for individuals seeking kidney transplants. Mechanisms leading to this differential should be explored to identify ways to mitigate this inequity.

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Abbreviations List

ASHD – atherosclerotic heart disease

CKD – chronic kidney disease

COPD – chronic obstructive pulmonary disease

CVA – cerebrovascular accident

ESKD – end-stage kidney disease

E-STAR – Early Steps to Transplant Access Registry

FFS – fee-for-service

HF – heart failure

KRT – kidney replacement therapy

MCO – managed care organization

PA – prior authorization

PDL – preferred drug list

SES – socioeconomic status

TIA – transient ischemic attack

USRDS – United States Renal Data System

Introduction

I. Epidemiology of End-Stage Kidney Disease (ESKD)

Prevalence and incidence of ESKD

End-stage kidney disease (ESKD) is a chronic medical condition where an individual's kidney is no longer able to function at the level necessary for daily function and patients must either receive maintenance dialysis or a kidney transplant to survive.[1] In 2022, around 815,000 individuals were living with ESKD in the United States of whom 67.8% were on dialysis, and 32.1% were living with a kidney transplant.[2] Latest incidence data demonstrates there were over 131,000 incident cases in 2022, representing a 31.3% increase from 2002 in large part due to an ageing population and an increase in key risk factors such as diabetes and hypertension.[2]

Risk factors for ESKD

Key risk factors for ESKD include older age, male sex, and being of Black, Native American or Hispanic descent.[2] For example, adults over 65 years of age are more than five times more likely than adults aged 64 years and under to be diagnosed with ESKD[2]; Men are 63% more times more likely to develop ESKD relative to women; and Black adults, Native American adults, and Hispanic adults, at 3.8-, 2.2-, and 2-times more likely to develop ESKD as compared with their white counterparts, respectively.[2]

Diabetes is the leading cause of ESKD, attributable to nearly 43% of all incident cases, followed by hypertension which is attributable to 30% of all new ESKD cases.[2] Other risk factors include heart failure, chronic obstructive pulmonary disease (COPD), atherosclerotic heart disease, as

well as other cardiac-related diseases,[2-5] as well as being overweight, and having family history of kidney disease.[6-7]

ESKD outcomes

Once someone is diagnosed with ESKD and receiving maintenance dialysis, risk of mortality, largely from cardiovascular disease, is high.[8] Data from United States Renal Data System (USRDS) shows the five-year survival rate is just 40.7% and 42.5% for incident cases initiating hemodialysis and peritoneal dialysis, respectively.[2] Risk of other outcomes such as hospitalization due to infection and vascular access are also high, especially during the first year of dialysis.[9]

While dialysis can maintain an individual's life, kidney transplant is the preferred treatment option as it is associated with lower mortality and lower costs.[2, 9-10] For example, five-year survival among adults who have received a transplant is 80.3 and 91.5% for deceased donor and living donor transplants recipients, respectively, as compared to 41.5% among adults receiving maintenance dialysis.[2]

Despite the ESKD population constituting just 1% of the Medicare population, 7.8% of total Medicare spending was allocated towards ESKD expenditures, translating to around $33.4 billion.[11] Over 80% of this spending was attributed to dialysis, amounting to around $26 billion.[11] Cost via inflation-adjusted per person per year spending is $87,000 and $100,000, for peritoneal and hemodialysis, respectively, but just $44,000 for transplants.[11]

Unfortunately, despite the benefits of transplant, not all individuals with ESKD will receive one owing to a relative donor shortage.

II. Disparities in Access to Kidney Transplant

There are several steps across multiple health systems that an individual must go through before they are able to receive a transplant (**Appendix A**). The typical process begins the day ESKD is diagnosed, which is generally considered the date dialysis is initiated. Patients are then referred to a transplant center for medical evaluation, which may include testing of kidney function, screening for other medical conditions, and assessment of blood for immunologic markers. Following initiation and completion of the medical evaluation, eligible candidates are then placed on the national donor waiting list. If a compatible donor arises, candidates will receive either a living or deceased donor transplant.[12-13] Unfortunately, in the setting of these scarce resources, inequities exist.

In 2022, just 3.1% of the 815,000 people with prevalent ESKD were added to the waitlist for a kidney transplant.[2] A growing body of research demonstrates important disparities by race, sex, and socioeconomic status (SES) at key steps of the transplant process. For example, studies have shown that Black individuals are 7.9% less likely to be referred[14], 4% less likely to be evaluated[15], and 14% less likely to be waitlisted after one-year of dialysis[16] when compared with White individuals. Women are 10% less likely to be referred[17], 7% less likely to be evaluated[17], and 18% less likely to be waitlisted.[18] Low-income individuals are 23% less likely to be waitlisted compared to high-income individuals.[18] Individuals living in the poorest

neighborhoods are 24% less likely to be evaluated, and 24% less likely to receive a transplant compared to those in the wealthiest neighborhoods.[19]

Insurance type is an important surrogate for an individual's SES. Perhaps unsurprisingly, individuals with poorer coverage are consistently shown to have reduced access to transplant. For example, incident ESKD adults with Medicaid coverage in the southeastern United States were 14% less likely to have been referred and 11% less likely to have been evaluated as compared with Medicare beneficiaries.[20] These same individuals were 32% less likely to have been referred and 28% less likely to have been evaluated as compared to those with private insurance.[20]

It is well known that changes in system level policies can impact transplant access. For example, the kidney allocation system (KAS) implemented in December 2014 redefined the starting point of waitlisting to the day dialysis was initiated (from date of first waitlisting), which aimed to improve disparities impacting minority groups, who were often delayed in being referred to transplant centers.[21] Post-KAS implementation saw an overall decrease in waitlisting times[15] and a greater proportion of Medicaid beneficiaries waitlisted (pre-KAS: 55.9% vs. post-KAS: 57.4%).[21] Though at the same time, public insurance holders were 33% more likely to be removed from the waitlist post-KAS implementation.[21] Whether insurance-specific policies impact transplant access is less known.

III. Medicaid and Medicaid Managed Care Organizations (MCOs)

Since the 1970s, all individuals initiating long-term dialysis in the United States receive Medicare coverage within 90 days of initiating dialysis regardless of age.[22] This can and is often supplemented with private and/or Medicaid insurance. Between 2020-2022, 24.2% of the ESKD incident population were receiving Medicaid insurance at time of dialysis initiation.[2]

Medicaid is a joint federal and state-funded health insurance program that primarily provides coverage to low-income adults and children, as well as pregnant women and adults with disabilities receiving financial assistance through the Supplemental Security Income (SSI) program.[23-24] The federal government has given states the right to design their individual Medicaid programs, given they comply with federal guidelines. Such flexibility allows for variability between state policies and the benefits individuals within the same care group receive.[24] One way to see this variability is by examining expansion vs. non-expansion states' eligibility requirements. Expansion states are those that have adopted the coverage options outlined in the Affordable Care Act (ACA).[25] In expansion states, the minimum qualifying income is 133% of the federal poverty level (FPL), which is $34,340.60 for a family of 3 and $20,029.80 for an individual.[25-27] However, eligibility rules in non-expansion states are less consistent, and often rely on additional factors aside from income (i.e., household size, family status, etc.).[25] Similar trends in variability among states can be observed when examining benefits and cost sharing guidelines across expansion and non-expansion states– benefits and cost-sharing guidelines tend to be more stringent in non-expansion states compared to expanded states.[25, 28]

Generally, adults with ESKD can qualify for Medicaid through either income or disability with implications for subsequent access to care. In most cases, disability eligibility is determined by whether ESKD has advanced enough that an individual receives Supplemental Security Income (SSI) disability benefits. However, as states can set their own disability criteria, types of patients that enroll via disability may vary by state. For example, South Carolina Medicaid allows individuals to petition for disability if they do not meet SSI requirements, though it is unclear what additional information is needed to meet those criteria. The end result is that in some states, individuals who qualified for Medicaid through disability are enrolled in fee-for-service (FFS) programs in which the state pays providers directly for beneficiary's services,[29] while in other states' applicants with disabilities or those that qualified for Medicaid through income may have to enroll in managed care organizations (MCOs).[30]

Medicaid MCOs are private insurance groups that individual states pay to administer care on their behalf. At an annually negotiated cost, MCOs assist in the delivery of Medicaid, managing costs, utilization, and quality.[31-32] As of 2021, 74% of all Medicaid beneficiaries in the US received care through a comprehensive MCO, demonstrating their wide-spread use.[33] Such extensive reach is not without reason. MCOs have been shown to improve access and quality of care for beneficiaries while containing costs and increasing states' Medicaid budget predictability.[31, 33] While budget predictability has improved, changes in the other claims remain mixed.[33]

MCOs receive payment prior to beneficiaries receiving services, meaning it is unknown to MCOs whether payments will fully cover their expenditures or not. If actual annual expenditures exceed states' estimates, MCOs are left to cover the costs. The financial risk taken up by MCOs incentivizes cost containment in order to not face a deficit.[31] Many argue attempts to reduce costs often translate to decreased service use for beneficiaries.[31]

There are several widely recognized techniques MCOs implement to contain expenditures, including prior authorization and network composition. Plans with prior authorization require beneficiaries to receive approval before they cover certain services.[34] Network composition is often of concern as the range of in-network providers offered by MCOs tend to be narrower compared to Medicaid FFS programs, which typically cover any providers willing to accept Medicaid beneficiaries.[31] The added difficulty these mechanisms place on providers and beneficiaries leads experts to suspect MCOs may actually be worsening healthcare accessibility and outcomes, in exchange for potentially reduced expenditures.

The impacts of these mechanisms have been explored in various populations. For example, national surveys found that an estimated 20% of Medicaid enrollees have cited having issues with prior authorization at MCOs, which is relatively higher than other insurance types, and is associated with worsening of their health.[30] While existing evidence does not conclusively show that these mechanisms limit enrollees' access, enough suggests they, alongside the financial risk inherent in MCOs' models, may contribute to reduced access and poorer outcomes relative to enrollees under Medicaid FFS programs.[30]

Whether MCOs contribute to disparities seen in Medicaid beneficiaries progressing through the kidney transplant process is unknown. As nearly 30% of all incident ESKD cases are receiving Medicaid[2], understanding the policy-specific factors driving these disparities could be critical in improving outcomes and access for this large sub-population.

Study Aim

In this study, I explored the association between state's mode of Medicaid administration and rates of transplant evaluation among Medicaid ESKD patients referred for kidney transplant.

Methods

I. Data Sources and Study Population

We identified all adults (18-80 years) with Medicaid insurance at time of being referred for a kidney transplant to one of 37 transplant centers captured in the Early Steps to Transplant Access Registry (E-STAR) between January 2015 and December 2020. E-STAR is a voluntary registry that collects data on transplant referral and evaluation start from 37 transplant centers from ESKD Networks 1 (n=11 transplant centers), 2 (n=10), 6 (n=11) and 9 (n=5) (**Appendix B**).[35-37] Individuals can be referred more than once but for this study we included first referral only. Individuals who had Medicaid along with another insurance type were included.

Individuals in E-STAR were linked to the United States Renal Data System (USRDS), a national registry of individuals in the US initiating kidney replacement therapy (KRT; dialysis or transplant) for the treatment of kidney failure[38], to identify patient-level characteristics (e.g., demographics, comorbidities) obtained from the CMS-2728 form which is completed within 45 days of KRT initiation. We excluded individuals who could not be cross-matched between E-STAR and USRDS (n=6,428; likely late stage chronic kidney disease patients not yet initiating KRT), individuals initiating dialysis outside of ESKD networks 1, 2, 6, and 9 (n=799), and those missing zip code data, race, ethnicity, or BMI (n=734). The final cohort included 12,226 Medicaid beneficiaries who were referred for kidney transplant in E-STAR (**Appendix C**).

II. Evaluation Start

The primary outcome was evaluation start within 6 months of referral. Evaluation start was defined as the date when a patient physically initiated a required component of the transplant evaluation process. Start date was defined by the transplant center and included first visit to the transplant center, visit to a satellite clinic or attendance at a required transplant education course. We specifically examined evaluation start within 6 months of patient's first referral date among those referred to a transplant center for evaluation. Six months was decided as the median time to evaluation among waitlisting patients as previous analysis has shown it to be 91 days (IQR = 81 – 107).[39] Individuals initiating KRT between 2015-2020 were followed for 6-months from first referral until evaluation start, or end of follow=up (December 31, 2021), whichever occurred first.

III. **Medicaid Administration**

The primary exposure of interest was state's mode of Medicaid administration for those who qualified for disability as determined through individual state's policies.[40-51] Disability was used to determine mode of administration as this was the most likely eligibility category under Medicaid that ESKD adults would qualify for. Three main modes of administration were identified: mandatory enrollment in managed care organizations (MCO), voluntary enrollment in MCOs, or state-ran fee-for-service (FFS) programs (**Appendix C**). Mandatory MCO enrollment served as the reference category.

IV. **Covariates**

Additional variables of interest, captured at time of KRT initiation included age (18-44 years, 45-64 years, and 65-80 years), race (Non-Hispanic White, Non-Hispanic Black, Hispanic, and other (which included Asian, Native American, Native Hawaiian / Other Pacific Islander, multiracial individuals, Mid-east or Arabian, and Indian sub-continent), sex (women, men), comorbidities (congestive heart failure, atherosclerotic heart disease, other cardiac disease, cerebrovascular disease, and peripheral vascular disease, hypertension, diabetes, smoking status, cerebrovascular accident / transient ischemic attack, chronic obstructive pulmonary disease, cancer), attributed cause of ESKD (diabetes, hypertension, glomerulonephritis, other (which included cystic kidney, other urologic, other cause, or unknown cause), pre-ESKD nephrology care (yes or no), BMI (underweight, normal, overweight, obese), and ESKD network (1, 2, 6, 9)For BMI, underweight corresponded to BMI < 18.5 kg/m^2, normal to between 18.5-24.9 kg/m^2, overweight to 25.0-29.9 kg/m^2, and obese to greater than 30 kg/m^2.[52]

Neighborhood-level characteristics were captured from the 2014 American Community Survey based on patients' zip codes and linked with USRDS's data. Variables included poverty level (> 20% or ≤ 20% of neighborhood living below poverty level), average percentage of high school graduates, average percentage of Black individuals, and rural/urban classification.

V. Statistical Analysis

All analyses were conducted using SAS version 9.4 (SAS Institute, Inc. Cary, North Carolina). Differences in demographic and clinical characteristics at time of KRT initiation by mode of Medicaid administration were examined using Chi-square tests for categorical variables,

independent t-tests for normally distributed continuous variables, and two-sample Mann-Whitney U tests for non-normally distributed continuous variables. The normality assumption was assessed for all continuous variables using density plots.

To determine the association between mode of Medicaid administration and 6-month evaluation start we used logistic regression adjusted for potential confounders of age, race/ethnicity, sex, primary cause of ESKD, comorbidities, access to pre-ESKD care, and neighborhood level characteristics. A random intercept was included in the model to factor in clustering of populations within ESRD networks. Existing literature was used to determine initial variables for the model. [17, 53] We conducted a complete case analysis since <2% of all variables were missing. An additional analysis was conducted to determine whether the association between MCO and likelihood of evaluation was modified if beneficiaries also had other insurance types (Medicaid only, Medicaid and Medicare, Medicaid and other). Similarly, variation in the association between MCO and likelihood of evaluation by sex was assessed due to known differences in access to evaluation for women[17] as well as higher rates of Medicaid enrollment among women[53].

This study adheres to the STROBE guidelines for observational studies, **see Appendix H**, adheres to the Declaration of Helsinki, and was approved by the institutional review board at Emory University (IRB00079596). The clinical and research activities being reported are consistent with the Principles of the Declaration of Istanbul as outlined in the 'Declaration of Istanbul on Organ Trafficking and Transplant Tourism.

Results

Baseline characteristics

In total, among all Medicaid patients with ESKD, 7,956 (65.07%), 3,240 (26.50%), and 1,030 (8.42%) were enrolled in mandatory MCO, voluntary MCO, and in FFS Medicaid, respectively. Among the overall study population, 47.64% were women, 51.81% were Non-Hispanic Black, and the median age was 50 years old (IQR: 38-59) (**Appendix D**). ESKD patients in mandatory MCO enrollment states were more likely to be White, less likely to be Hispanic, more likely to have received pre-nephrology care, more likely to be obese, and less likely to live in rural neighborhoods as compared with patients in voluntary MCO states. ESKD patients in mandatory MCO enrollment states were less likely to be White, less likely to be Hispanic, less likely to receive pre-nephrology care, more likely to be obese and more likely to live in rural neighborhoods as compared with patients in FFS states (**Appendix D**).

Association between MCO type and likelihood of 6-month evaluation

Overall, 5,995 (49.03%) patients were evaluated within 6 months of their first referral to a transplant center. In crude models, voluntary MCO enrollment was associated with a 1.26-fold (crude OR [cOR] = 1.26, [95% confidence interval [CI] 1.11, 1.43]) and state FFS programs were associated with a 1.9-fold (cOR = 1.92, [1.63, 2.25]) increased likelihood of evaluation within 6 months as compared with mandatory MCO enrollment. After adjusting for demographic, clinical, and neighborhood characteristics, voluntary enrollment was associated with a 1.3-fold (adjusted OR [aOR] = 1.25, [1.08, 1.45]) and state FFS was associated with a 1.7-

fold (aOR = 1.77, [1.49, 2.12]) increased likelihood of evaluation within 6 months as compared with mandatory MCO enrollment (**Appendix E).**

Association between MCO type and likelihood of 6-month evaluation by insurance status and sex

The association between MCO and evaluation was similar across insurance categories in that MCO consistently had the lowest evaluation rates, though there was some variation in the magnitude of the effect (**Appendix F**). For example, among individuals receiving only Medicaid, living in FFS states was associated with a 2.6-fold (aOR = 2.65, [2.07, 3.39]) increased likelihood of evaluation as compared with mandatory MCO, but this effect size was 1.31 (aOR = 1.31, [1.05, 1.64]) and 1.43 (aOR = 1.43, [0.67, 3.07]) in Medicaid plus Medicare and Medicaid with other, respectively. For voluntary vs mandatory MCO, Medicaid only had 23% increased likelihood of evaluation, as compared to 12% and 64% in Medicaid plus Medicare and Medicaid with other, respectively. The association between MCO and evaluation rates were similar among men and women (**Appendix G**).

Discussion

For Medicaid beneficiaries with kidney failure seeking lifesaving transplants, this study suggests that the mode of Medicaid administration as elected by individual states significantly influences an individual's likelihood of being evaluated for transplant, a critical and necessary step to be waitlisted and eventually receive a transplant. Overall, individuals in states with FFS had the highest likelihood of evaluation, followed by voluntary MCO, and then mandatory MCO states. This was generally true regardless of if the individual also had additional insurance coverage, and was similar for both men and women. These findings have important implications for individuals on Medicaid who already have lower access to transplant compared with Medicare and privately insured individuals[20], and mitigating disparities between states through improved policies and care delivery should be a priority.

Whether mandatory MCOs are associated with worse health access and outcomes for all conditions and populations is unclear. For example, Burns found that Medicaid adults with disabilities enrolled under mandatory MCOs were 10% more likely to experience extended waiting times (i.e., >30 minutes) to see a provider and 32% more likely to have difficulties meeting with specialists when compared with their counterparts under FFS programs.[54] Among Medicaid enrollees aged >65 years and adults with disabilities in California, a statewide transition to mandatory MCO enrollment saw a 20% increase in difficulty obtaining primary care appointments and a 29% increase in difficulties meeting with specialists, relative to pre-mandatory enrollment.[55] Our findings similarly highlight decreased access to getting a transplant evaluation when MCOs are mandated, though causal mechanisms are not clear.

In non-Medicaid ESKD populations, mandatory MCO enrollment still appears to influence transplant access, perhaps suggesting a role for the broader systemic impacts of health policies. For example, Pifer et al. found that among ESKD individuals primarily covered with Medicare, those under mandatory MCOs generally reported poorer health outcomes and satisfaction with healthcare access as compared with FFS enrollees, citing issues such as greater difficulty in accessing referrals.[56] Adler et al. found enrollees under Medicare Advantage (MA) plans were 18% less likely to be waitlisted within one year of dialysis initiation as compared with individuals under FFS Medicare. [57] These findings highlight the importance of flexible and comprehensive insurance coverage in facilitating access to transplant.

In other instances, mandatory MCOs have demonstrated positive effects on health outcomes and access. Symum & Castro found improved maternal health amongst Medicaid mothers following statewide transition to mandatory Medicaid MCO in Florida, with incident preterm births and post-partum hospital readmissions reduced by 6% and 13%, respectively, compared to pre-mandatory enrollment.[58] Examining the same policy transition, Hu et al. found a 8% decrease in preventable emergency department following mandatory enrollment implementation, with greater reductions observed in racial and ethnic minority groups.[59] Differences in determining mode of administration, demands of the studied population, and geographic variation, for example, have been noted as possible factors contributing to inconsistencies. Though it appears mandatory MCOs offer a potential means for improving health, identification of the factors associated with these improvements is necessary for benefits to extend to other populations.

The capitated risk model in which MCOs operate may explain, at least in part, why ESKD individuals have lower access to evaluation than other healthcare delivery models. In an examination of the plan policies of the MCOs operating within the states in our study population, we found that identified MCOs often had caveats, such as prior authorization, in place before beneficiaries could access pre-transplant services. While these strategies may offer financial savings for managed care plans, they often act as barriers to care for patients and providers. Recent reports found 93% of physicians report prior authorization delays patient access to necessary care and 82% find the time-consuming process increases likelihood of patients abandoning treatment.[62] For ESKD adults seeking transplant, these delays can be detrimental. Transplant centers often require candidates to have control of co-existing comorbidities before advancing through the process, as doing so improves post-transplant survival and overall patient outcomes.[62-63] However, prior authorizations may introduce delays in treatment and specialist appointments, making it harder for patients to complete requirements in a timely manner and potentially exacerbating existing access challenges. In contrast, FFS policies generally do not have such requirements facilitating easier access to specialists. To mitigate financial risk, MCOs are also more likely to have restricted access to in-network transplant centers, limiting opportunity for patients especially those that live large distances from transplant centers.[57] ESKD adults who receive coverage through MCOs, whether in accordance with mandated MCO enrollment states or by opting-in to an MCO in voluntary enrollment states, these mechanisms may prove to be a barrier in allowing timely access through the kidney transplant continuum as compared to individuals who receive care through FFS plan.

Strengths of this study include the use of the regional E-STAR which allowed us to examine the critical early pre-waitlisting step of evaluation, a step not currently captured in national surveillance data. Policy measures have repeatedly emphasized the need to increase transplant rates, but such goals require comprehensive understanding of the entire transplant process, including understudied pre-waitlisting steps like evaluation.[20] As evaluation is not consistently captured on the national-level, even smaller-scale studies can help identify mechanisms and barriers reducing progression to this step.[60] There are, however, some limitations to be considered. First, E-STAR is restricted to just four regions in the US and thus findings may not be generalizable nationally. Nonetheless, the demographic of E-STAR patients is similar to national data.[2] Second, we are limited to data captured in routine electronic medical records and there may be residual confounding from variables (e.g., individual-level socioeconomic status and transplant center characteristics) that we were unable to adjust in our analysis. Third, we were limited by small sample sizes to examine differences among beneficiaries with additional insurance types. For example, Medicaid plus other included private and VA coverage and we were unable to tease out any differences between these groups. Finally, MCO assignment was based on state and not individual and thus individual variation is not captured. Nonetheless, our research question was specific to examining the state-level variation, and we accounted for several individual and neighborhood-level confounders where possible.

There are several important future directions for this work. First, it will be important to expand this analysis to other states in the U.S. to see whether findings remain consistent on the national level, as well as exploring important state-based variation. Second, inclusion of other state-level factors, such as barriers to transplant reception and coverage of pre-transplant services, which

may influence MCO administration and access to transplant should be included. Third, additional sensitivity analyses surrounding MCO effects on dual Medicaid-Medicare enrollees would be worth exploring. Patients with ESKD are eligible for Medicare coverage within 90 days of KRT initiation. While Medicaid coverage at time of KRT initiation is likely to have downstream implications for access, examining this group after 90 days and with full Medicare coverage will be important to examine long-term impacts of MCO programs. Finally, examining the impact of these policies across the full transplant care continuum (from dialysis initiation to receipt of transplant) will be important to understand at what step MCO has the greatest impact, and what possible policy changes could be enacted to improve equity across states and MCO delivery.

Conclusion

Amongst Medicaid enrollees seeking lifesaving transplant for kidney failure, mode of Medicaid administration was significantly associated with the likelihood of starting the medical evaluation within 6 months of referral, with adults in FFS states having the best access, followed by voluntary MCOs and mandatory MCOs . These results reinforce concerns of mandatory MCOs, or MCOs in general, reducing access to care as compared with FFS programs. This study provides important preliminary data to suggest further investigation and policy reform is needed to ensure populations like Medicaid enrollees are progressing through the transplant process.

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Appendices

Appendix A. Figure 1

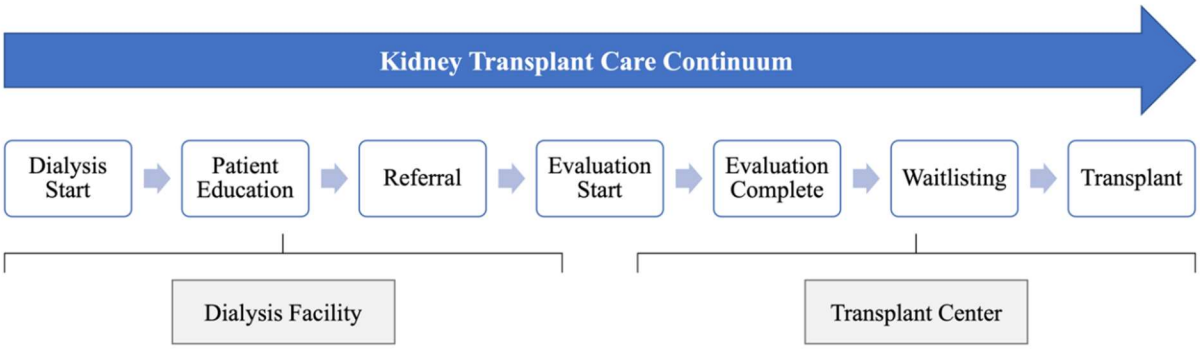

Figure 1. Kidney transplant care continuum. Adapted from Harding et al. Transplantation Reviews 202135(4):100654[56]

Appendix B. Figure 2

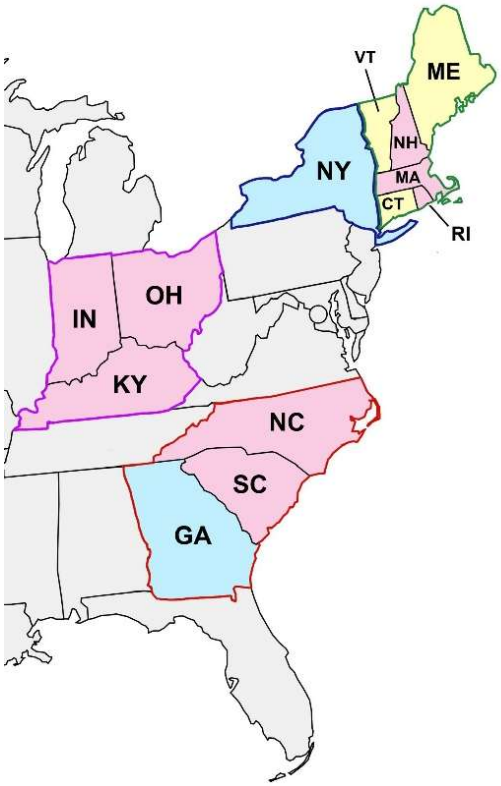

Figure 2. E-STAR Registry - ESKD Networks 1 (green), 2 (navy blue); 6 (orange); 9 (purple) with modes of Medicaid Administration by state (mandatory – pink; voluntary – light blue; FFS – yellow)

Appendix C. Figure 3

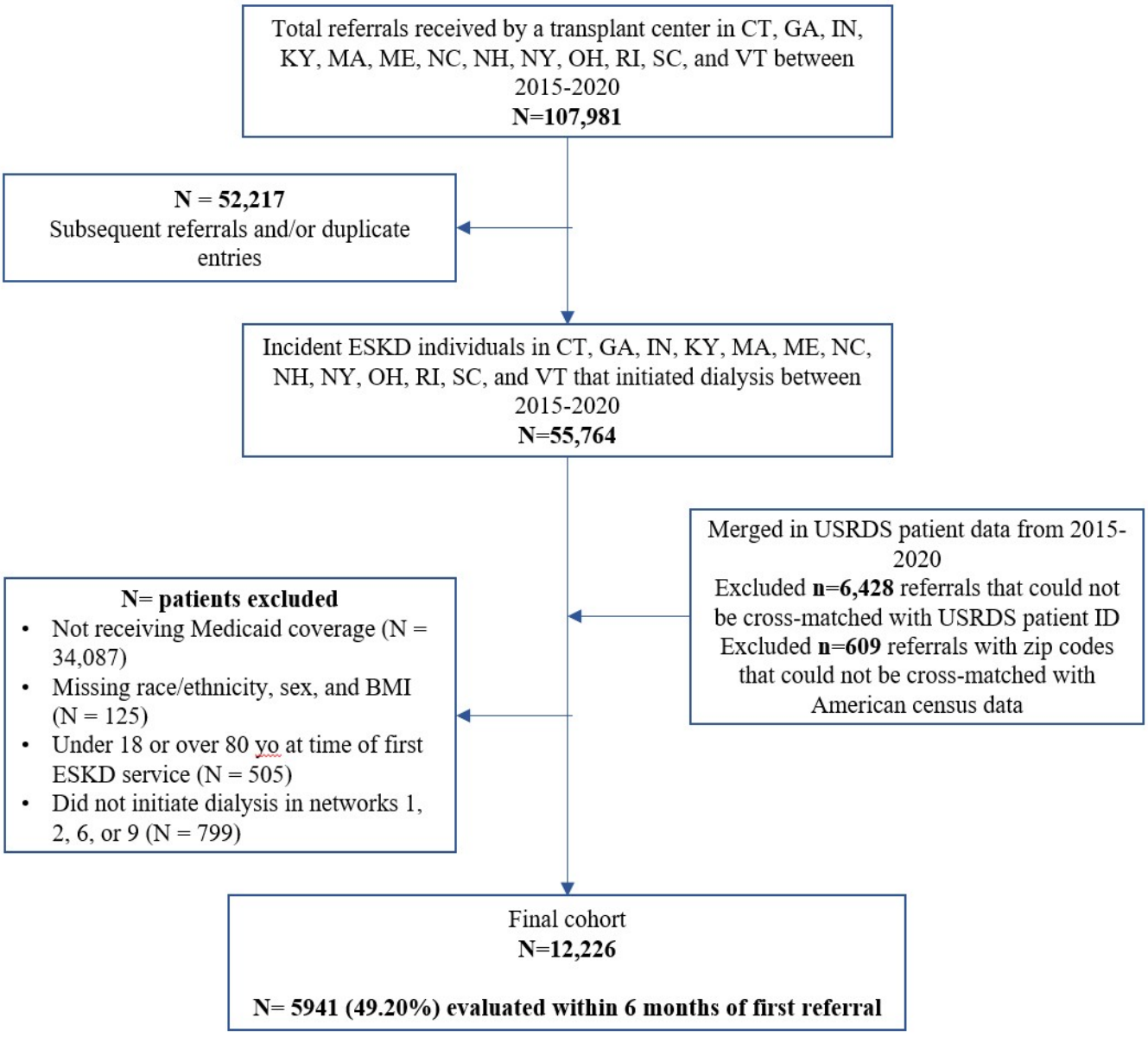

Figure 3. Final study cohort

Appendix D. Table 1

Table 1. Demographic and clinical characteristics of individuals with ESKD referred for a kidney transplant insured by Medicaid, at time of KRT initiation and by mode of Medicaid administration

	Total	Mandatory MCO Enrollment	Voluntary MCO Enrollment	Fee-for-service
N (%)	12,226 (100.0)	7,956 (65.07)	3240 26.50	1030 8.42
Demographic Characteristics				
Age in years, median (IQR)	50.0 (38.0-59.0)	49.0 (39.0-58.0)	50.0 (38-60)	51.0 (39.0-59.0)
Age category, *n (%)*				
18-44 years	4,581 (37.47)	3045 (38.27)	1,188 (36.67)	348 (33.79)
45-64 years	6,284 (51.40)	4108 (51.63)	1,622 (50.06)	554 (53.79)
65-80 years	1,361 (11.13)	803 (10.09)	4,30 (13.27)	128 (12.43)
Sex, *n (%)*				
Women	5,825 (47.64)	3857 (48.48)	1,548 (47.78)	420 (40.78)
Race, *n (%)*				
Non-Hispanic White	4,087 (33.43)	3079 (38.70)	541 (16.70)	467 (45.34)
Non-Hispanic Black	6,334 (51.81)	4053 (50.94)	1,942 (59.94)	339 (32.91)
Hispanic	1,312 (10.73)	600 (7.54)	518 (15.99)	194 (18.83)
Other	493 (4.03)	224 (2.82)	239 (7.38)	30 (2.91)
Insurance Type, *n (%)*				
Medicaid only	6,917 (56.58)	4,486 (56.39)	1,855 (57.25)	576 (55.92)
Medicaid with Medicare	4,729 (38.68)	3,138 (39.44)	1,192 (36.79)	326 (38.74)
Medicaid with other	580 (4.74)	332 (4.17)	193 (5.96)	55 (5.34)
Clinical Characteristics				
Primary Cause of ESKD*, *n (%)*				
Diabetes	5,513 (46.06)	3,681 (47.13)	1347 (42.83)	485 (47.88)
Hypertension	3,382 (28.26)	2,085 (26.70)	1113 (35.39)	184 (18.16)
Glomerulonephritis	1,653 (13.81)	1,106 (14.16)	376 (11.96)	171 (16.88)
Other	1,420 (11.86)	938 (12.01)	309 (9.83	173 (17.08)
Pre-ESKD nephrology care*, *n (%)*				
Yes	8,309 (80.20)	5,619 (82.71)	1,888 (71.62)	802 (86.24)
Comorbidities*, *n (%)*				
Congestive heart failure	2,867 (23.55)	1,916 (24.19)	694 (21.53)	257 (25.00)
Atherosclerotic heart disease	1,144 (9.40)	725 (9.15)	256 (7.94)	163 (15.86)
Peripheral vascular disease	898 (7.38)	590 (7.45)	179 (5.55)	129 (12.55)
Other cardiac disease	1,638 (13.40)	1,119 (14.07)	370 (11.42)	149 (14.47)
Diabetes	6,100 (49.90)	4,018 (50.51)	1,568 (48.40)	514 (49.90)
CVA / TIA	910 (7.48)	601 (7.59)	234 (7.26)	75 (7.30)
Hypertension	10,963 v90.06)	7,112 (89.79)	2,948 (91.44)	903 (87.84)
COPD	769 (6.32)	572 (7.22)	130 (4.03)	67 (6.52)
Current Smoker	1,194 (9.81)	862 (10.88)	223 (6.92)	109 (10.60)
Cancer	338 (2.78)	232 (2.93)	85 (2.64)	21 (2.04)
Obesity (BMI, kg/m^2), *n (%)*				
Underweight	1,657 13.55	1,069 (13.44)	468 (14.44)	120 (11.65)
Normal weight	2,758 22.56	1,702 (21.39)	808 (24.94)	248 (24.08)
Overweight	2,742 22.43	1,723 (21.66)	756 (23.33)	263 (25.53)
Obese	5,069 41.46	3,462 (43.51)	1,208 (37.28)	399 (38.74)
Neighborhood Characteristics				
Neighborhood poverty level, *n (%)*				
<20% below poverty	7,813 (63.90)	5,242 (65.89)	1,803 (55.65)	768 (74.56)
≥20% below poverty	4,413 (36.10)	2,714 (34.11)	1,437 (44.35)	262 (25.44)

% High school graduates, *mean (±sd)* *	80.88 (8.21)	83.80 (7.52)	79.95 (8.92)	84.96 (8.63)
% Black population, *mean (±sd)* *	29.64 (26.45)	27.12 (25.44)	40.05 (27.83)	16.33 (17.28)
Urban / rural classification, *n (%)*				
Urban	10,536 (86.18)	6,654 (83.63)	2.960 (91.36)	922 (89.51)
Micropolitan/small town/rural	1,690 (13.82)	1,302 (16.37)	280 (8.64)	108 (10.49)
ESKD Network *n (%)*				
1	2,631 (21.52)	1,601 (20.12)	0 (0.00)	1,030 (100.00)
2	1,711 (13.99)	0 (0.00)	1,711 (52.81)	0 (0.00)
6	4,081 (33.38)	2,552 (32.08)	1,529 (47.19)	0 (0.00)
9	3,803 (31.11)	3,803 (47.80)	0 (0.00)	0 (0.00)

* 1866 (15%) of patients missing pre-ESKD nephrology care, 53 (<0.01%) missing information on comorbidities, 258 (2%) missing primary cause of ESKD, 2 (<0.01%) missing information on % high school graduates, 1 (<0.01%) missing information on % Black population

** BMI = body mass index; COPD = chronic obstructive pulmonary disease; CVA = cerebrovascular accident; ESKD = end-stage kidney disease; KRT = kidney replacement therapy; TIA = transient ischemic attack

Appendix E. Table 2

Table 2. Association between patient characteristics and starting evaluation within 6 months of referral among patients initiating KRT in ESRD networks, 1, 2, 6 and 9, 2015-2020 with follow up until 2021

	Evaluation started within 6 months of referral n (%)	Evaluation not started within 6 months of referral n (%)	Odds ratio (OR) reporting association between each characteristic and likelihood of evaluation start	
			Crude OR (95% CI)	Adjusted OR[a] (95% CI)
N (%)	5,995 (49.03)	6,231 (50.97)		
Mode of Medicaid Administration				
Mandatory MCO enrollment	3,247 (40.81)	4,709 (59.19)	Reference	Reference
Voluntary MCO enrollment	2,097 (64.72)	1,143 (35.28)	1.26 (1.11, 1.43)	1.25 (1.08, 1.45)
State FFS program	651 (63.20)	379 (36.80)	1.92 (1.63, 2.25)	1.77 (1.49, 2.12)
Demographic Characteristics				
Age category				
18-44 years	2,406 (52.52)	2,175 (47.78)	Reference	Reference
45-64 years	2,958 (47.07)	3,326 (52.93)	0.74 (0.69, 0.80)	0.80 (0.73, 0.88)
65-80 years	631 (46.36)	730 (53.64)	0.65 (0.57, 0.74)	0.69 (0.59, 0.81)
Sex				
Men	3,182 (49.71)	3,219 (50.29)	Reference	Reference
Women	2,813 (48.92)	3,012 (51.71)	1.02 (0.95, 1.10)	1.05 (0.96, 1.14)
Race				
Non-Hispanic White	1,923 (47.04)	2,164 (52.95)	Reference	Reference
Non-Hispanic Black	2,956 (46.67)	3,378 (53.33)	0.91 (0.84, 0.99)	0.89 (0.79, 0.99)
Hispanic	803 (61.20)	509 (38.80)	1.05 (0.91, 1.20)	1.09 (0.93, 1.28)
Other	313 (63.49)	180 (36.51)	1.12 (0.91, 1.37)	1.11 (0.88, 1.40)
Insurance type				
Medicaid only	3,449 (49.86)	3,468 (50.14)	Reference	Reference
Medicaid plus Medicare	2,222 (46.99)	2,507 (53.01)	0.91 (0.84, 0.98)	0.98 (0.89, 1.07)
Medicaid plus other	324 (55.86)	256 (44.14)	1.11 (0.93, 1.33)	1.14 (0.93, 1.39)
Clinical Characteristics				
Primary Cause of ESKD				
Diabetes	2,584 (46.87)	2,929 (53.13)	Reference	Reference
Hypertension	1,602 (47.37)	1,780 (52.63)	1.02 (0.93, 1.12)	1.04 (0.91, 1.17)
Glomerulonephritis	904 (54.69)	749 (45.31)	1.37 (1.22, 1.54)	1.24 (1.06, 1.44)
Other	771 (54.30)	649 (45.71)	1.35 (1.19, 1.52)	1.26 (1.07, 1.48)
Pre-ESKD nephrology care				
No	994 (48.46)	1,057 (51.54)	Reference	Reference
Yes	4,163 (50.10)	4,146 (49.90)	1.17 (1.05, 1.29)	1.20 (1.08, 1.34)
Comorbidities				
Congestive heart failure	1,209 (42.17)	1,658 (57.83)	0.69 (0.63, 0.75)	0.78 (0.71, 0.87)
Atherosclerotic heart disease	537 (46.94)	607 (53.06)	0.82 (0.72, 0.94)	0.98 (0.84, 1.14)
Peripheral vascular disease	399 (44.43)	499 (55.57)	0.79 (0.68, 0.91)	0.87 (0.74, 1.03)
Other cardiac disease	739 (45.12)	899 (54.88)	0.85 (0.76, 0.95)	1.03 (0.91, 1.16)
Diabetes	2,911 (47.72)	3,189 (52.28)	0.90 (0.84, 0.97)	1.08 (0.97, 1.22)
CVA / TIA	402 (44.18)	508 (55.82)	0.80 (0.69, 0.92)	0.92 (0.78, 1.07)
Hypertension	5,345 (48.75)	5,618 (51.25)	0.86 (0.76, 0.98)	0.98 (0.85, 1.13)
COPD	256 (33.29)	513 (66.71)	0.54 (0.46, 0.64)	0.63 (0.52, 0.75)
Current Smoker	425 (35.59)	769 (64.41)	0.61 (0.53, 0.69)	0.62 (0.54, 0.72)
Cancer	173 (51.18)	165 (48.82)	1.09 (0.87, 1.36)	1.11 (0.86, 1.42)
Obesity (BMI, kg/m^2)				

Underweight	839 (50.63)	818 (49.37)	1.09 (0.96, 1.24)	1.05 (0.91, 1.21)
Normal weight	1,396 (50.62)	1,362 (49.38)	Reference	Reference
Overweight	1,419 (51.75)	1,323 (48.25)	1.09 (0.98, 1.22)	1.11 (0.98, 1.26)
Obese	2,341 (46.18)	2,728 (53.82)	0.95 (0.86, 1.05)	0.95 (0.85, 1.06)
Neighborhood Characteristics				
Neighborhood poverty level				
<20% below poverty	3,882 (49.69)	3,931 (50.31)	Reference	Reference
≥20% below poverty	2,113 (47.88)	2,300 (52.12)	0.91 (0.84, 0.99)	0.94 (0.83, 1.06)
% High school graduates, *mean (±sd)*	82.63 (8.63)	83.12 (7.77)	1.00 (1.00, 1.01)	1.00 (0.99, 1.01)
% Black population, *mean (±sd)*	29.40 (26.48)	29.86 (26.41)	0.99 (0.99, 1.00)	1.00 (0.99, 1.00)
Urban / rural classification				
Urban	5,296 (50.27)	5,240 (49.73)	Reference	Reference
Micropolitan/small town/rural	699 (41.36)	991 (58.64)	0.88 (0.79, 0.98)	0.87 (0.77, 0.98)

BMI = body mass index; COPD = chronic obstructive pulmonary disease, CVA = cerebrovascular accident, ESKD = end-stage kidney disease; KRT = kidney replacement therapy; MCO = managed care organization; OR = odds ratio, TIA = transient ischemic attack

[a] Multivariable model was adjusted for all characteristics in table 2

Appendix F. Table 3

Table 3. Association between Medicaid administration mode and evaluation rate, stratified by insurance coverage

	Evaluation started within 6 months of referral n (%)	Evaluation not started within 6 months of referral n (%)	Odds ratio (OR) reporting association between each characteristic and likelihood of evaluation start	
			Crude OR (95% CI)	Adjusted OR[a] (95% CI)
Overall				
Mandatory MCO enrollment	3,247 (40.81)	4,709 (59.19)	Reference	Reference
Voluntary MCO enrollment	2,097 (64.72)	1,143 (35.28)	1.26 (1.11, 1.43)	1.25 (1.08, 1.46)
State FFS programs	651 (63.20)	379 (36.80)	1.92 (1.63, 2.25)	1.77 (1.49, 2.11)
Coverage Types				
Medicaid only				
Mandatory MCO enrollment	2,642 (58.89)	1,844 (41.11)	Reference	Reference
Voluntary MCO enrollment	1,212 (65.34)	643 (34.66)	1.25 (1.05, 1.49)	1.23 (1.01, 1.49)
State FFS program	393 (68.23)	183 (31.77)	2.81 (2.25, 3.51)	2.65 (2.07, 3.39)
Medicaid with Medicare				
Mandatory MCO enrollment	1,242 (39.58)	1,896 (60.42)	Reference	Reference
Voluntary MCO enrollment	756 (63.42)	436 (36.58)	1.32 (1.09, 1.61)	1.12 (0.85, 1.48)
State FFS program	224 (56.14)	175 (43.86)	1.22 (0.95, 1.57)	1.31 (1.05, 1.64)
Medicaid with other				
Mandatory MCO enrollment	161 (48.49)	171 (51.51)	Reference	Reference
Voluntary MCO enrollment	129 (66.84)	64 (33.16)	1.25 (0.64, 2.43)	1.64 (0.84, 3.18)
State FFS program	34 (61.82)	21 (38.18)	1.12 (0.63, 2.00)	1.43 (0.67, 3.07)

[a] Multivariable model was adjusted for age, sex, race, primary cause of ESKD, access to pre-nephrology care, comorbidities, and neighborhood characteristics

Appendix G. Table 4

Table 4. Association between Medicaid administration mode and evaluation rate, stratified by sex

	Evaluation started within 6 months of referral n (%)	Evaluation not started within 6 months of referral n (%)	Odds ratio (OR) reporting association between each characteristic and likelihood of evaluation start	
			Crude OR (95% CI)	Adjusted OR[a] (95% CI)
Overall				
Mandatory MCO enrollment	3,247 (40.81)	4,709 (59.19)	Reference	Reference
Voluntary MCO enrollment	2,097 (64.72)	1,143 (35.28)	1.26 (1.11, 1.43)	1.25 (1.08, 1.46)
State FFS programs	651 (63.20)	379 (36.80)	1.92 (1.63, 2.25)	1.77 (1.49, 2.11)
Sex				
Men				
Mandatory MCO enrollment	1,670 (40.74)	2,429 (59.26)	Reference	Reference
Voluntary MCO enrollment	1,136 (67.14)	556 (32.86)	1.30 (1.08, 1.58)	1.35 (1.09, 1.68)
State FFS program	376 (61.64)	234 (38.36)	1.91 (1.55, 2.35)	1.73 (1.38, 2.17)
Women				
Mandatory MCO enrollment	1,577 (40.89)	2,280 (59.11)	Reference	Reference
Voluntary MCO enrollment	961 (62.08)	587 (37.92)	1.24 (1.04, 1.47)	1.20 (0.99, 1.46)
State FFS program	275 (65.48)	145 (34.52)	1.95 (1.51, 2.50)	1.83 (1.39, 2.42)

[a] Multivariable model was adjusted for age, race, primary cause of ESKD, access to pre-nephrology care, comorbidities, and neighborhood characteristics

Appendix H. STROBE Statement - Checklist of items that should be included in reports of cohort studies

	Item No	Recommendation
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported
Objectives	3	State specific objectives, including any prespecified hypotheses
Methods		
Study design	4	Present key elements of study design early in the paper
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up
		(*b*) For matched studies, give matching criteria and number of exposed and unexposed
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group
Bias	9	Describe any efforts to address potential sources of bias
Study size	10	Explain how the study size was arrived at
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding
		(*b*) Describe any methods used to examine subgroups and interactions
		(*c*) Explain how missing data were addressed
		(*d*) If applicable, explain how loss to follow-up was addressed
		(*e*) Describe any sensitivity analyses
Results		
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed
		(b) Give reasons for non-participation at each stage
		(c) Consider use of a flow diagram
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders
		(b) Indicate number of participants with missing data for each variable of interest

		(c) Summarise follow-up time (eg, average and total amount)
Outcome data	15*	Report numbers of outcome events or summary measures over time
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included
		(*b*) Report category boundaries when continuous variables were categorized
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses
Discussion		
Key results	18	Summarise key results with reference to study objectives
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence
Generalisability	21	Discuss the generalisability (external validity) of the study results
Other information		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at http://www.strobe-statement.org.

Appendix I. Comparison of Medicaid and MCO policies amongst states in E-STAR Registry

	States												
	GA	NC	SC	IN	KY	OH	CT	VT	ME	MA	NH	RI	NY
(Across all eligibility groups...) Is Medicaid coverage provided through the state or Medicaid managed care (MMC) plans?	Both	Both	Both	Both	Both	Both	State	State	State	Both	Both	Both	Both
Are kidney transplants covered according to state Medicaid policy?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Are there any potential caveats or constraints to this coverage (i.e., prior authorization)?	No	No	No	Yes	Yes	Yes	Yes	Yes	No[1]	Yes	No	Yes	Yes
Are pretransplant services (e.g., pretransplant evaluations) covered by state Medicaid program?	Yes	Yes	Yes	Yes	Yes	Yes	Yes[2]	Yes[2]	Yes	Yes	Yes[3]	Yes	Yes
Are there any potential caveats to this coverage (i.e., prior authorization)?	No	No	No	No	No	No	No	No	NA[3]	NA	NA	NA	NA

Excludes out-of-state procedures[1]; Explicitly mentioned dialysis[2]; Not explicitly stated[3]

A. For Medicaid beneficiaries enrolling in Medicaid due to recent End-Stage Renal Disease (ESRD) diagnosis (not previously enrolled in Medicaid)

	States												
	GA	NC	SC	IN	KY	OH	CT	VT	ME	MA	NH	RI	NY
Does ESRD diagnosis automatically qualify individual for Medicaid?	No	No	No	Yes[4]	No	No	Partially[5]	No	No	No	No	No	No
Explicit eligibility category provided for ESRD beneficiaries	None	None	None	State-run specialty program for ESKD patients	None	None	Partially[6]	None	None	No	No	No	No
-> If no explicit category, most likely category in which to gain Medicaid eligibility?	Disability	Disability	Disability	Does not apply	Disability	Disability	Disability	Disability	Disability	Disability	Disabiliry	Disability	Disability
How is care administered for beneficiaries who qualify under disability?	State	Both	Both	State	Both	Both	State	State	State	MCO	Borh	MCO	MCO
Based on above, is enrollment in MMC plan(s) mandatory, voluntary, or not an option for enrollees?	Voluntary	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	N/A	N/A	N/A	Mandatory	Mandatory	Mandatory	Mandatory[7]

Has specialty programs for ESKD adults that do not qualify through other eligibility categories[5]; Qualifies individual for HUSKY Health's Outpatient Dialysis coverage[6]; Mandatory unless has existing comorbidities[7]

B. For Medicaid enrollees (e.g., eligible on the basis of low income) at the time when confronted with End Stage Renal Disease diagnosis

	Georgia			North Carolina					South Carolina				
	CareSource	Peach State Health Plan	AmeriGroup	Amerihealth Caritas	Carolina Complete Health	Healthy Blue North Carolina	UnitedHealthcare Community Plan of North Carolina	WellCare	Absolute Total Care	Healthy Blue by Bluechoice of SC	Humana Health Horizons in SC	Molina Healthcare of South Carolina	Select Health of South Carolina
Are kidney transplants covered by MCO?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No[2]	Yes	No[2]	Yes	No[2]
Are there any potential caveats or constraints to this coverage (i.e., prior authorization)?	Yes; prior authorization may be required	Yes; prior authorization is required	Yes; precertification is required	Yes; subject to prior approval	Yes; requires prior authorization	Yes; requires prior authorization	Yes; requires prior authorization	Yes; requires prior authorization	Yes; requires prior authorization	Yes; requires prior authorization	Yes; requires prior authorization	Yes; requires prior authorization	Yes; requires prior authorization
Are pretransplant services covered by state Medicaid program?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Are there any potential caveats or constraints to this coverage (i.e., prior authorization)?	Yes	Yes	NA	No	No	NA	No	No	No	NA	No	Yes; requires prior authorization	No

Not explicitly stated[1]; SC employs carve-out mechanism transplant procedure, exclude pre- and post-transplant services[2];

B. For Medicaid enrollees (e.g., eligible on the basis of low income) at the time when confronted with End Stage Renal Disease diagnosis

	Indiana				Kentucky					Ohio			
	Anthem BlueCross BlueShield	CareSource	Managed Health Services	MDWise	Aetna Better Health of Kentucky	Passport by Molina Healthcare	Humana CareSource	United Healthcare Community Plan of Kentucky	Wellcare of Kentucky	Aetna Better Health of Ohio	Buckeye Health Plan	Molina Healthcare of Ohio	Paramount Advantage
Are kidney transplants covered by MCO?	Yes	Yes	Yes	Yes[3]	Yes	Yes	Yes	Yes	Yes	NA	Yes	Yes	Yes
Are there any potential caveats or constraints to this coverage (i.e., prior authorization)?	Yes; requires prior authorization	Yes; requires prior authorization	Yes; requires prior authorization	NA	Yes; requires prior authorization	Yes; requires prior authorization	Yes; requires prior authorization	Yes; requires prior authorization	Yes; requires prior authorization	NA	Yes	Yes; requires prior authorization	Yes; prior authorization is required
Are pretransplant services covered by state Medicaid program?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Are there any potential caveats or constraints to this coverage (i.e., prior authorization)?	No	No	Yes	Yes	Transplant evaluations require prior authorization	No	NA	NA	NA	No	No	No	Yes[4]

Excluded from MDWise's package C[3]; Only when referred to out-of-network provider[4]

B. For Medicaid enrollees (e.g., eligible on the basis of low income) at the time when confronted with End Stage Renal Disease diagnosis

	Massachussetts		New Hampshire			Rhode Island		
	WellSense Essential MCO	Tufts Health Together	AmeriHealth Caritas New Hampshire	NH Healthy Families	WellSense Health Plan	Neighborhood Health Plan of Rhode Island	Tufts Health RITogether	UnitedHealthcare Community Plan of Rhode Island
Are kidney transplants covered by MCO?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Are there any potential caveats or constraints to this coverage (i.e., prior authorization)?	Yes	Yes	Yes	Yes	Yes	Yes	Yes; requires prior authorization	Yes
Are pretransplant services covered by state Medicaid program?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Are there any potential caveats or constraints to this coverage (i.e., prior authorization)?	No[5]	Yes	No	No	No	Yes	No[6]	Yes

State has carved out transplant procedure in this plan[5]; For in-network services only[6]

B. For Medicaid enrollees (e.g., eligible on the basis of low income) at the time when confronted with End Stage Renal Disease diagnosis

	New Hampshire			New York[7]						
	AmeriHealth Caritas New Hampshire	NH Healthy Families	WellSense Health Plan	Molina Health Plan	AmidaCare Special Needs	Fidelis Care + Legacy Plan	Health First	HIP Combined by Emblem Health	United Health Care	Molina Health Plan
Are kidney transplants covered by MCO?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA	Yes
Are there any potential caveats or constraints to this coverage (i.e., prior authorization)?	Yes	Yes	Yes	NA	Yes; requires prior authorization	Yes	Yes; requires prior authorization	Yes; requires prior authorization	NA	NA
Are pretransplant services covered by state Medicaid program?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Are there any potential caveats or constraints to this coverage (i.e., prior authorization)?	No	No	No	NA	Yes	NA	NA	Yes	Yes	NA

Following plans offered in state but restricted information for non-members: MVP Health Plan, United Healthcare Community Plan, Hamaspik. Inc[7]