Nephrology Times

Practical News, Trends, and Analysis

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Gastric Bypass Surgery Lowers Rate of CKD Progression versus Best Medical Treatment

In patients with type 2 diabetes, chronic kidney disease (CKD) is a major contributor to early mortality. Most patients in this population have stage G1 to G3 and A2 to A3 CKD based on the presence of microalbuminuria, defined as urinary albumin-to-creatinine ratio (ACR) 30-300 mg/g, or macroalbuminuria, defined as urinary ACR >300 mg/g, in the context of estimated glomerular filtration rate >30 mL/min/1.73 m^2.

While advances in the pharmacotherapy of type 2 diabetes are associated with progress in treating CKD, for many patients CKD remains a chronic progressive disease. One independent risk factor for CKD is obesity. Results of observational studies suggest an association between metabolic surgery and reduced albuminuria as well as long-term incidence of end-stage renal disease. Those results support the premise that significant weight loss may have a key role in long-term reductions in the risk for kidney disease in patients with obesity and type 2 diabetes.

Ricardo Vitor Cohen, MD, and colleagues designed the MOMS (Microvascular Outcomes after Metabolic Surgery) trial to test the hypothesis that Roux-en-Y gastric bypass (RYGB) surgery would be more effective than best medical treatment to achieve remission of microalbuminuria in

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Awareness and Control of Hypertension among Hispanic/Latino Patients with CKD

The largest minority in the United States are Hispanics/Latinos. An estimated 57.5 million Hispanics/Latinos reside in the United States, a number that is expected to double in the next 20 years. Thus, according to **Claudia M. Lora, MD,** and colleagues, there will be continued growth of the Hispanic chronic kidney disease (CKD) population.

Compared with non-Hispanic whites, Hispanic/Latino individuals in the United States have a higher rate of end-stage renal disease: 456 versus 337 per million

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Comprehensive ESRD Care Model Associated with Reduced Healthcare Costs

End-stage renal disease (ESRD) is associated with a high mortality rate, reduced quality of life, and extensive healthcare use and spending. Kidney transplantation is the treatment of choice for patients with ESRD, however, most patients with ESRD are dependent on renal replacement therapy. Data from 2013 reveal that 63% of all patients with ESRD received hemodialysis, 7% received peritoneal dialysis, and 30% received a functioning renal transplant.

In the United States, Medicare is the primary insurer for individuals with ESRD. In 2016, there were 618,818 beneficiaries with ESRD with Medicare as the primary or secondary payer (81% of all patients in the United States with ESRD). Patients with ESRD comprised less than 1% of the Medicare population, yet beneficiaries with ESRD accounted for more than 7% of Medicare fee-for-service (FFS) payments.

During the past 10 years, the Centers for Medicare & Medicaid services launched initiatives designed to reduce Medicare expenditures while maintaining or enhancing quality of care. The Comprehensive ESRD Care (CEC) model is one such initiative. In the CEC model, dialysis facilities, nephrologists, and other providers and suppliers form ESRD Seamless Care Organizations (ESCOs) to coordinate care for beneficiaries with ESRD and are accountable for quality and financial outcomes for their aligned Medicare beneficiaries. ESCOs are eligible for shared savings if they lower Medicare Part A and Part B payments and meet quality standards.

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Comprehensive ESRD Care Model

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A total of 13 ESCOs joined the CEC model on October 1, 2015 (wave 1). An additional 24 ESCOs joined the CEC model on January 1, 2017 (wave 2).

Researchers, led by **Grecia Marrufo, PhD,** performed an economic evaluation to examine the association of the CEC model with Medicare payments, healthcare use, and quality of care. Results of the evaluation were reported in *JAMA Internal Medicine* [2020;180(6):852-860].

The evaluation utilized a difference-in-differences design to estimate the change in outcomes for 73,094 Medicare FFS beneficiaries aligned to CEC dialysis facilities between the baseline (January 2014 to March 2015) and intervention periods (from October 2015 to December 2017) relative to 60,464 beneficiaries at matched dialysis facilities. The primary outcomes and measures were Medicare total and service-specific payments per beneficiary per month (PBPM); hospitalizations, readmissions, and emergency department (ED) visits; and select quality measures.

There were differences between CEC-participating facilities and nonparticipating facilities in several market-level and facility-level characteristics. Compared with nonparticipating facilities (n=4019) prior to the start of the model, CEC facilities (n=685) were less rural (mean percentage rural, 8% vs 16%) and were located in larger markets that had a lower mean proportion of white beneficiaries with ESRD (59% vs 63%) and had higher median incomes ($56,147 vs $52,283) and more specialists per 10,000 population.

CEC facilities had more dialysis stations (mean, 19.7 vs 18.3), lowered standardized risk-adjusted morality rates (mean, 0.95 vs 1.01), were more likely to be Fresenius facilities (mean, 72% vs 21%), and were less likely to provide peritoneal services (mean, 8% vs 9%).

In the pre-CEC period, mean total Medicare payments to providers were $6315 PBPM; in the intervention period, mean total Medicare payments to providers were $6100 PBPM. In the comparison group, mean total Medicare payments decreased from $6317 PBPM in the pre-CEC period to $6315 PBPM in the intervention period. Relative to comparison beneficiaries, the difference in mean payments was a net decrease of $114 PBPM (95% confidence interval [CI], –$202 to –$26; *P*=.01) for CEC beneficiaries, amounting to a savings of 1.8%. The decreases were associated primarily with decreases in payments for hospitalizations and readmissions. However, when shared savings payments of $247 PBPM are considered, Medicare experienced net losses of $78 PBPM (95% CI, –$8 to $164; *P*=.07).

Relative to the comparison group, there was a decrease of $68 PBPM (95% CI, –$112 to –$24; *P*=.003) in inpatient payments, and a decrease in readmission payments of $29 PBPM (95% CI, –$57 to –$2; *P*=.04). There was also a decrease of $10 PBPM (95% CI, –$19 to –$0.49; *P*=.04) in payments for hospitalizations related to ESRD complications for CEC beneficiaries relative to the comparison group. Total dialysis payments increased for CEC beneficiaries relative to the comparison group by $15 PBPM (95% CI, $7-$24; *P*<.001). All payment results were associated primarily with wave 1 ESCOs.

Relative to the comparison group, CEC beneficiaries had –5.0 fewer hospitalizations per 1000 beneficiaries per month (95% CI, –8.5 to –1.6; *P*=.004), a 4% relative decrease. The decrease in hospitalizations was also associated with wave 1 ESCOs. Overall, there was trend toward fewer ED visits among CEC beneficiaries compared with the comparison group; the difference did not reach statistical significance. There was no overall change in rates of hospital readmission or emergency dialysis sessions. There was an increase in outpatient dialysis sessions of 71.3 (95% CI, 27.4-115.3; *P*=.001) per 1000 beneficiaries per month overall, an increase of 0.58%. The results were due primarily to wave 1.

In analyses of quality-of-care indicators, the CEC model was associated with improvements. CEC model beneficiaries with a catheter as vascular access for periods >90 days decreased by 0.78 percentage points (95% CI, –1.36 to –0.19 percentage points; *P*=.01) relative to the comparison group, an 8.3% difference per month. Beneficiaries in CEC models were also 0.11 percentage points less likely (95% CI, –0.20 to –0.02 percentage points; *P*=.01) to require hospitalization in a given month due to an ESRD-related complication, a 6.4% difference per month. The results were associated primarily with wave 1 ESCOs in performance year 1. There were no associations between the CEC model and hospitalizations for complications related to vascular access.

The researchers cited some limitations to the study findings, including the possibility that the 37 ESCOs were not representative of all Medicare dialysis providers, limiting the generalizability of the findings; the characteristics selected for matching and the specificity of the data may not adequately account for all differences between CEC beneficiaries and the comparison group; and not comparing outcomes for patients with ESRD in the CEC with those in other accountable care organization (ACO) programs.

In conclusion, the researchers said, "During the first two performance years of the CEC, Medicare payments decreased by 2% while quality improved, which suggests that a specialty-centered ACO model can deliver more efficient care to a clinically complex and vulnerable population. The data suggest that ensuring adequate dialysis, thereby reducing hospitalizations, was a likely mechanism. Further analysis is required to assess the longer-term outcomes of the CEC model and to consider the applicability of these results to populations with other complex chronic conditions." ■

TAKEAWAY POINTS

- In October 2015, the Centers for Medicare & Medicaid Services launched the Comprehensive ESRD [End-Stage Renal Disease] Care (CEC) model. Results of a recent economic evaluation of the CEC model relative to non-CEC beneficiaries were reported in *JAMA Internal Medicine*.
- In the first two performance years, the CEC model resulted in lower Medicare payments or providers and improved performance healthcare use and quality-of-care measures.
- Lower costs were associated primarily with reduced numbers of hospitalization and readmission; Medicare experienced net losses when shared savings payments were taken into account.

Awareness and Control of Hypertension

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population. Inadequate detection and control of hypertension may be a factor contributing to this increasing health issue.

Previous studies and analyses of data from the National Health and Nutrition Examination Survey (NHANES) have revealed lower rates of hypertension awareness, treatment, and control among Mexican Americans compared with non-Hispanic whites. However, available data are largely limited to Mexican Americans. Dr. Lora et al. designed a cross-sectional cohort study to examine hypertension prevalence, awareness, treatment, and control among Hispanics/Latinos with and without CKD. The study utilized data from HCHS/SOL (Hispanic Community Health Study/Study of Latinos). Results of the study were reported in *Kidney Medicine* [2020;2(3):332-340].

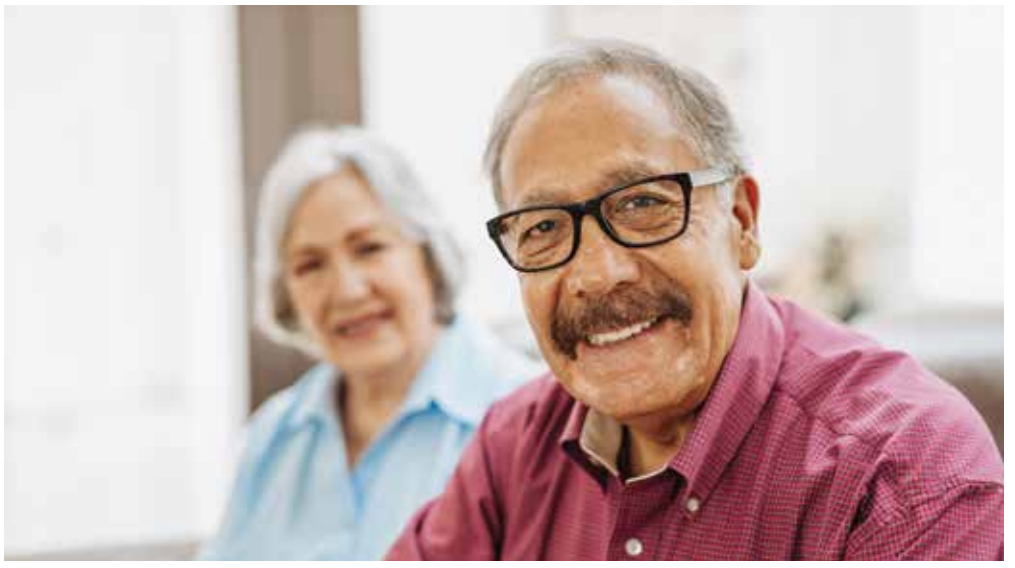
The researchers compared data on US Hispanics/Latinos 18 to 74 years of age enrolled in HCHS/SOL with data from NHANES 2007 to 2010. CKD was defined as estimated glomerular filtration rate <60 mL/min/1.73 m^2 or urinary albumin-creatinine ratio ≥30 mg/g creatinine. The outcomes of interest were hypertension, defined as systolic blood pressure ≥140 mm Hg or diastolic blood pressure ≥90 mm Hg or use of antihypertensive medication. To assess hypertension control, two thresholds were examined: <140/90 and <130/80 mm Hg.

Participants self-reported demographic variables of age, sex, income, education, insurance status, place of birth, and length of residency; they self-reported their backgrounds as Cuban, Dominican, Mexican, Puerto Rican, or Central or South American. The category "other" was used for participants belonging to a group not listed or to more than one group. Medical history was obtained, including currently used medications. Height and weight were measured and body mass index (BMI) was calculated as kg/m^2.

There were 1818 HSHS/SOL participants with CKD. Of those, 44 had missing data, resulting in an analysis cohort of 1774 participants. Mean age was 49 years, 57% were women, 61% had health insurance, 51% had BMI >30 kg/m^2, mean eGFR was 92 mL/min/1.73m^2, and median urinary albumin-creatinine ratio was 60 mg/g.

The prevalence of hypertension was 51.5%. Of the participants with hypertension, 78.1% were aware of their diagnosis and 70.4% were receiving treatment. The proportion of individuals with hypertension and adequate blood pressure control was low: 32.6% had blood pressure <140/90 mm Hg; 17.9% had blood pressure <130.80 mm Hg.

Compared with those without hypertension, those in the hypertension group were more likely to be ≥45 years of age and men. They were also more likely to be born outside the United States and to have lived in the United States for ≥10 years; more likely to have an income <$20,000, less than a high school education, health insurance coverage, diabetes, and BMI ≥30 kg/m^2. Those with hypertension were more likely to be of Cuban or Puerto Rican background and less likely to be of Mexican background. The hypertensive participants also had lower eGFRs compared with those without hypertension.



The proportion of individuals with hypertension and adequate blood pressure control was low: 32.6% had blood pressure <140/90 mm Hg; 17.9% had blood pressure <130.80 mm Hg.

Results of comparison of awareness of hypertension among the participants with hypertension found that compared with those in the not-aware group, those in the aware group were more likely to have lived in the United States ≥10 years, be of Dominican background, and have health insurance, diabetes, and lower eGFR. Compared with untreated individuals with hypertension, those with treated hypertension were older and more likely to have health insurance, diabetes, and lower eGFRs.

Compared with those with hypertension with blood pressure ≥140/90 mm Hg, those with hypertension and blood pressure <140/90 mm Hg were more likely to have health insurance, have diabetes, and have been born in the United States. Those with blood pressure <140/90 mm Hg were also more likely to be aware of their diagnosis of hypertension and reported taking a higher number of antihypertensive medications. In comparisons of individuals with blood pressure ≥130/80 mm Hg versus <130/80 mm Hg, the characteristics were similar.

In subgroup multivariable analyses, those with stage 3 CKD or higher were more than three times as likely to have hypertension awareness compared with those with stage 1 CKD (odds ratio [OR], 3.48; 95% confidence interval [CI], 1.60-7.59). In addition, compared with those with diabetes, individuals without diabetes were less likely to be aware of hypertension (OR, 0.51; 95% CI, 0.32-0.81). The odds of treatment for hypertension were more than two-fold greater for those with health insurance compared with those without health insurance (OR, 2.44; 95% CI, 1.49-4.01). There was a graded association between CKD stage and treatment (stage 2 vs stage 1, OR, 1.76; 95% CI, 1.10-2.81; stage 3 vs stage 1, OR, 3.44; 95% CI, 1.88-6.28).

The prevalence of hypertension in the HCHS/SOL participants with CKD was lower compared with the prevalence in non-Hispanic whites with CKD in NHANES. Hypertension awareness and control were higher among non-Hispanic whites than in the other groups.

The researchers cited some limitations to the study findings, including the use of a single measurement of creatinine, cystatin C, and urinary albumin excretion to define CKD; measuring blood pressure at a single visit; and the inability to ascertain medication adherence data.

"In conclusion, we found a high prevalence of hypertension and a low prevalence of awareness, treatment, and control among Hispanics/Latinos with CKD, a group at high risk for future cardiovascular disease events and end-stage kidney disease. Improvement of hypertension awareness, treatment, and control should be a public health priority to reduce the disproportionate burden of CKD in this growing population," the researchers said. ■

TAKEAWAY POINTS

- Researchers conducted a cross-sectional cohort study to examine hypertension prevalence, awareness, and treatment and control among Hispanics/Latinos with chronic kidney disease (CKD).
- The cohort included US Hispanics/Latinos 18 to 74 years of age enrolled in the Hispanic Community Health Study/Study of Latinos with CKD. Hypertension was defined as systolic blood pressure ≥140 mm Hg or diastolic blood pressure ≥90 mm Hg.
- There was a high prevalence of hypertension among the Hispanic/Latino study participants (51.5%); the prevalence of awareness, treatment, and control was low among the study participants.

Gastric Bypass Surgery

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patients with obesity, type 2 diabetes, and early-stage CKD at baseline. The researchers reported outcomes from the first 24 months of the trial online in *JAMA Surgery* [doi.10.1001/jamasurg.2020.0420].

Eligible patients with established type 2 diabetes and microalbuminuria were recruited from a single center from April 1, 2013, to March 31, 2016. Follow-up was 5 years, including a prespecified intermediate analysis at 24 months. The primary outcome of interest was remission of albuminuria (urinary ACR <30 mg/g). Secondary outcomes included CKD remission rate, absolute change in urinary ACR, metabolic control, other microvascular complications, quality of life, and safety.

The cohort included 100 patients who were randomized to receive best medical treatment (n=49) or RYGB (n=51). Mean age of the cohort was 51.4 years and 55% were male. Baseline demographic and clinical characteristics were similar between the two groups. At 24 months, 92 patients had complete assessment with no crossovers. Eight patients (three in the best medical treatment group and five in the RYGB arm) did not receive the assigned intervention. The efficacy (intention-to-treat) population included 100 patients; safety and medication use were assessed in a total of 92 patients, 46 in each group.

After 24 months, in the 92 patients with complete data, 84% (36/43) of the RYGB group achieved the primary outcome, compared with 56% (24/43) of those in the best medical treatment group (risk difference, 0.279; 95% confidence interval [CI], 0.094-0.464). In an intention-to-treat analysis, 55% (95% CI, 39.0%-70.0%) of patients in the best medical treatment group and 82% (95% CI, 72%-93%) of patients in the RYGB group achieved albuminuria remission (P=.006).

The estimated remission rate of early-stage CKD was 48.2% (95% CI, 32.3%-64.1%) among patients in the best medical treatment group and 81.9% (95% CI, 71.8%-92.1%) among patients after RYGB (P=.002).

Metabolic control was defined as normalization of glycemic control (fasting glucose level <100 mg/dL and hemoglobin A1c ≤6.0%), blood pressure control (systolic blood pressure <130 mm Hg and diastolic blood pressure <80 mm Hg), and lipid levels (low-density lipoprotein cholesterol [LDL-C] <100 mg/dL and <70 mg/dL in patients with cardiovascular disease and triglyceride levels <150 mg/dL). At 24 months, the estimated proportion of patients reaching the American Diabetes Association (ADA) target for diabetes remission was 24.4% after best medical treatment and 44.5% after RYGB.

At 24 months, there was no difference in systolic or diastolic blood pressure between the groups or in the proportion of patients in either group reaching the ADA blood pressure targets. Significantly more patients in the RYGB group reached LDL-C level targets compared with the best medical treatment group (73% vs 51%; P=.048).

In the best medical treatment group, 41% met the triglyceride level target of 150 mg/dL; in the RYGB group, the target was met by 81% (P<.001). High-density lipoprotein C levels were unchanged after best medical treatment, but increased by 13.5 mg/dL (95% CI, 10.97-16.1 mg/dL) in the RYGB group (P<.001 for post-treatment scores).

The mean change in total body weight at 24 months was –4.5% (95% CI, –6.1% to –3.1%) in the best medical treatment group and –25.4% (95% CI, –26.9% to –23.8%) in the RYGB group. Mean estimated body mass index (BMI) of patients in the best medical treatment group was 31.2 at 24 months compared with 24.3 after RYGB. Fewer than 5% of patients in the best medical treatment group achieved 15% body weight loss, whereas more than 95% of those in the RYGB group lost more than 15% of body weight. In the best medical treatment group, the mean estimated proportion of patients who achieved BMI in the normal range was 0%, compared with 51% in the RYGB group (P<.001).

There were no differences between the two groups in progression of diabetic retinopathy and neuropathy.

During the 24 months, the safety profile of RYGB was comparable to that of best medical treatment. There were no deaths, episodes of serious hypoglycemia, malnutrition, or excessive weight loss in either group.

There were some limitations to the study cited by the authors, including the inherent open-label design, the short follow-up, and minor baseline differences in lipid-lowering medication use and race/ethnicity between groups that were statistically significant, although not deemed to be clinically relevant.

In conclusion, the researchers said, "After 24 months, RYGB was more effective than best medical treatment for achieving remission of albuminuria and CKD stage G1 to G-3 and A2 to A-3 in patients with type 2 diabetes and obesity. Our findings highlight the potential of RYGB as a new treatment paradigm that should be considered to slow or arrest CKD progression in patients with type 2 diabetes and obesity." ■

TAKEAWAY POINTS

- Researchers reported 24-month results from a study to compare the albuminuria-lowering effects of Roux-en-Y gastric bypass (RYGB) surgery versus best medical treatment in patients with early-stage chronic kidney disease (CKD), type 2 diabetes, and obesity.
- A total of 100 patients from a single center were randomized to either RYGB surgery or best medical treatment. At 24 months, remission of albuminuria occurred in 55% of patients in the best medical treatment group versus 82% of patients in the RYGB group.
- The rates of CKD remission were 48% in the best medical treatment group and 82% in the RYGB group (P=.002).

CONFERENCE COVERAGE AMERICAN TRANSPLANT CONGRESS

Outcomes of Transplantation with Kidneys from Deceased Donor with APKPD

Patients with autosomal dominant polycystic kidney disease (ADPKD) are routinely not considered as potential donors for renal transplantation. There is a concern that peri-transplant acute kidney injury may accelerate cystogenesis in kidneys from patients with ADPKD similarly as it accelerates cystogenesis in animal ADPKD models. However, the immunosuppression may have cystogenesis-inhibiting effects, as has been seen in animal ADPKD models.

Researchers at the University of Alabama at Birmingham, led by **M. C. Chumley,** conducted a study to quantify the effects of transplantation on cystogenesis in kidneys from a donor with ADPKD. They reported results of the study during a virtual poster session at the American Transplant Congress 2020 in a poster titled *Effects of Kidney Transplantation on Cystogenesis in Kidneys procured from a Deceased Donor with Autosomal Dominant Polycystic Kidney Disease*.

Two kidneys from a deceased ADPKD class 1A donor were transplanted into two individuals. Magnetic resonance imaging was performed at 1 month, 6 months, and 18 months post-transplant. To estimate the ADPKD classification for each recipient at individual time points, image and LabVIEW-based software tools were developed and used to measure and compare total kidney volumes and individual cyst volumes at each time point.

At 18 months post-transplant with a ADPKD kidney, total kidney volume increased by 6.45% in recipient one and 38.85% in recipient two (an annual total kidney volume increase of 0.745% and 21.45%, respectively). In recipient one, cyst numbers increased from 20 in month 1 to 32 at 18 months post-transplant. In recipient two, cyst numbers increased from 10 in month 1 to 22 at 18 months-post-transplant. In recipient one, of the 21 individual cysts tracked, 12 increased in volume and nine decreased in volume. In recipient two, of the two individual cysts tracked, one increased in volume and one decreased in volume.

At 18 months, recipient one had a serum creatinine level of 1.4 mg/dL and glomerular filtration rate (GFR) of 52 mL/min/1.73 m^2; recipient two had serum creatinine level of 1.5 mg/dL and GFR of 43 mL/min/1.73 m^2.

Imaging classification of ADPKD was used to determine the ADPKD classification of each kidney at each time point. Classification was estimated and compared using height-adjusted total kidney volume and age of the kidneys. For each recipient, there was a shift in the ADPKD classification to a more severe class. In recipient one, there was a shift in classification from 1A to 1B, and in recipient two, there was a shift in classification from 1A to 1C.

In conclusion, the researchers said, "These data suggest that ADPKD kidneys from mildly affected ADPKD deceased donors may be used as marginal renal allografts in kidney transplantation and the cystogenic responses in transplanted ADPKD kidney allografts may differ between recipients."

Source: Chumley MC, Kim H, Williams DM, Kumar V, Mrug M. Effects of kidney transplantation on cystogenesis in kidneys procured from a deceased donor with autosomal dominant polycystic kidney disease. Abstract of a poster presented at the virtual American Transplant Congress (Abstract D-025), May 30, 2020.

Conference Coverage

August 29-31, 2020

2020 ANNA VIRTUAL NATIONAL SYMPOSIUM

The American Nephrology Nurses Association (ANNA) celebrated more than 50 years of education, advocacy, networking, and science for nephrology nurse members at its virtual 2020 National Symposium. From its beginning in 1969, ANNA has grown to 8500 members, representing healthcare professionals working in areas that include conservative management, hemodialysis, peritoneal dialysis, continuous renal replacement therapy, transplantation, industry, and government and regulatory agencies.

Due to COVID-19, ANNA's 2020 National Symposium was held virtually, August 29-31. As always, the symposium provided an opportunity for ANNA members to learn, collaborate, and network with fellow nephrology professionals from across the country and the world. Expert speakers and colleague nurses presented innovations and knowledge in all areas of quality patient care in the nephrology setting.

30-Day Readmission in Patients on Hemodialysis in the Hospital Setting

In 2016, total Medicare spending for end-stage renal disease (ESRD) amounted to $35 billion, and among patients on dialysis, hospitalization accounted for 40% of total Medicare payments. **Analyne Babaylan, BSN, RN, VA-BC,** and **Phung Tran, MSN, RN** conducted a retrospective and descriptive survey to identify the top three discharge diagnoses for 30-day readmission of patients with ESRD on hemodialysis in a hospital setting. The researchers sought to determine the appropriate intervention to reduce admissions in that patient population.

Results of the study were reported during the virtual 2020 ANNA National Symposium in a session titled *Top Three Discharge Diagnoses of 30-Day Readmission for End-Stage Renal Disease (ESRD) Patients on Hemodialysis in a Hospital Setting.*

The study was conducted at a 143-bed, not-for-profit, full-service acute care hospital. The in-hospital dialysis unit has two beds and the dialysis team includes five nurses and one technician. Data were gathered using a reporting function from an electronic medical record system from January 1, 2018, through September 30, 2019.

Forty patients met the 30-day readmission criteria for the 21-month study period. Of the 40 patients, 24 were male with a median age of 66 years and 16 were female with a median age of 67 years; the age of the total study cohort ranged from 31 to 90 years. The average length of stay was 3.9 days. The top three discharge diagnoses were: (1) diabetes mellitus (22.4%); (2) hypertension (10.3%); and (3) acute respiratory failure with hypoxia, pneumonia, and sepsis (6.5%).

The authors said, "With one in three ESRD patients being readmitted within 30 days, results will be used to develop an intervention to educate staff and patients on how to manage their diabetes and hypertension during their dialysis treatment. Reducing hospital readmission for ESRD patients decreases morbidity and mortality and improves their quality of life."

Source: Babaylan A, Tran P. Top three discharge diagnoses of 30-day readmission for end-stage renal disease (ESRD) patients on hemodialysis in the hospital setting. Abstract of a session presented during the virtual American Nephrology Nurses Association 2020 National Symposium, August 29-30, 2020.

The first camp in 1994 had five campers; camps now host up to 200 campers and family members each session.

Specialty Camps Benefit Children with Solid Organ Transplant

Children with end-stage organ failure require intensive management and education to enable allograft function and improve their quality of life. Children in that patient population are frequently behind their peers in many important areas. **Sara Kennedy, BSN, RN, CNNe,** and **Cindy Richards, BSN, RN, CNN,** created a camp for children with late-stage organ failure to enhance their emotional, physical, and psychological well-being. The camps were described at the 2020 ANNA National Symposium in a session titled *The Benefits of a Specialty Camp for Children with End-Stage Organ Failure.*

The program provides four camps for children who have received a solid organ transplant and their families: one is for children ages 12 to 18 years; one is for recipients and their immediate families; one is for young adults 18 to 25 years of age; and the fourth is a 1-day camp run during the winter school holiday to maintain the momentum begun at the summer sessions.

Camp activities include fun projects, coping skills, peer support, financial education, vocational rehabilitation, career counseling, psychological counseling sessions, educational sessions on nutrition and pharmaceutical needs, fitness, and the effects of chronic illness on quality of life. Each event involves a transplant coordinator, physician, registered nurses, social workers, counselors, child life therapists, nutritionists, and other volunteers. The camps are offered to all attendees at no cost.

The first camp in 1994 had five campers; camps now host up to 200 campers and family members each session. Campers and families have formed lasting friendships, and knowledge gained at the educational sessions has increased quality of life for many attendees. Campers have gone on to college, often using scholarship awards, and often return to serve as counselors and role models to the younger campers.

The authors said, "By offering additional educational experiences away from the hospital, we are able to enhance the quality of life of children who have received a solid organ transplant, and help them learn additional ways to assist in improving their outcomes, minimizing illnesses, and helping them to become independent successful young adults."

Source: Kennedy S, Richards C. The benefits of a specialty camp for children with end-stage solid organ failure. Abstract of a presentation at the virtual 2020 American Nephrology Nurses Association National Symposium, August 29-31, 2020.

Improving Mineral and Bone Disorder Care Coordination with KDIGO Guidelines

In 2018, Medicare expenditures related to end-stage renal disease (ESRD) accounted for more than 23% of its total budget. One of the leading causes of mortality among patients with ESRD is mineral and bone disease, which is associated with bone loss, osteoporosis, fractures, and vascular calcification.

Recommendations from the Kidney Disease Improving Outcomes (KDIGO) guidelines call for a trend of three indicators to assess the risk of vascular calcification in patients with ESRD. At the virtual ANNA National Symposium, **Sandra Scott Watson, DNP, FNP-C, APRN,** and colleagues reported on a project at the North Tulsa Fresenius dialysis center to increase the percentage of patients with all three indicators within range. The session was titled *Implementing Effective Care Using KDIGO Guidelines for Mineral and Bone Disorders (CKD-MBD) in Hemodialysis.*

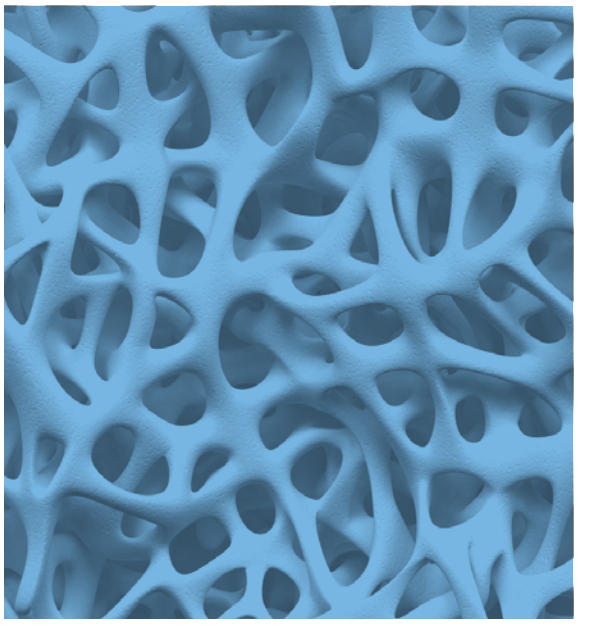
In December 2018, only 46% of patients at the center had all three indicators within the recommended range, compared with a national average of 60%. The program was developed to increase comprehensive bone mineral care to more than 90% in 90 days using KDIGO guidelines with checklist and care coordination logs.

The project utilized four rapid plan-do-study-act (PDSA) cycles that included interventions for screening, use of care coordination log, and concurrent engagement of patients and care team members. Using KDIGO guidelines, a provider checklist was used to evaluate risks. The intervention then utilized a patient engagement tool of education and motivational interviewing. Patients identified as being at risk were followed on the care coordination log. A checklist was used to improve team engagement. Throughout the four PDSA cycles, there were iterative changes in the four interventions.

The checklist was refined over the initial 8 weeks, and there was significant improvement in documentation. There were significant decreases in phosphorus and parathyroid hormone levels. Patient engagement with motivational interviewing was standardized, which improved patient readiness for change. Concerns and gaps in care were identified via the care coordination log.

"Care was effective using KDIGO guidelines in a SBIRT [screening, brief intervention, and referral to treatment] model with standardized patient engagement," the researchers said.

Source: Watson SS, Jolles D, Pasricha A, Halderson J, Harmon K, Miller J. Implementing effective care using KDIGO guidelines for mineral and bone disorders (CKD-MBD) in hemodialysis. Abstract of a presentation at the virtual American Nephrology Nurses Association 2020 National Symposium, August 29-31, 2020.



Conference Coverage

August 29-31, 2020

Pilot Project: Renal Diet and Fluid Restriction Survival Guide

Patients with end-stage renal disease (ESRD) often do not receive adequate education on the need for appropriate diet and fluid restriction, putting those patients at increased risk for morbidity and mortality. Results of a literature review suggest that 50% of patients receiving maintenance hemodialysis are nonadherent in some form during their treatment; nonadherence to renal diet and fluid restriction is common.

In a presentation at the virtual 2020 ANNA National Symposium, **Carly Thompson, RN,** and DNP student, outlined the need for patient education regarding the importance of adherence to renal diet and fluid restriction. The session was titled *Renal Diet and Fluid Restriction Survival Guide for Hemodialysis.*

The PICOT [patient/interaction/comparison/outcome/time] question was: In patients with ESRD initiating dialysis, how does a survival education guide for diet and fluid restriction education affect patients' knowledge of diet and fluid restriction within the first year of hemodialysis?

A brochure titled *Renal Diet and Fluid Restriction Survival Guide* will be distributed to participating patients at an adult nephrology unit. Eligible participants in the pilot project will have been on hemodialysis for 1 year or less. Participants will be tested prior to the intervention by completing the End-Stage Renal Disease Adherence Questionnaire (ESRD-AQ). Following completion of the ESRD-AQ, participants will receive the survival guide, which will be explained by the investigator. At 2 to 14 days following receipt of the guide, participants will again complete the ESRD-AQ to ascertain whether the intervention has resulted in a statistically significant improvement.

The educational tool will be evaluated in the inpatient setting and, if it is found be associated with statistically significant improvement in patient diet and fluid restriction education, it may also be of use to primary care providers. Creation of an educational tool that can be used by collaborating providers will result in patients with ESRD having a multidisciplinary team working together to empower them to improve their health by adhering to diet and fluid restriction.

"The identified population in this project will benefit from health promotion and education. This innovative project will fill a gap in the current practice of patient education on renal diet and fluid restrictions," the author said.

Source: Thompson C. Renal diet and fluid restriction survival guide for hemodialysis. Abstract of a presentation at the virtual 2020 American Nephrology Nurses Association National Symposium, August 29-31, 2020.

Patients with end-stage renal disease often do not receive adequate education on the need for appropriate diet and fluid restriction.

Reducing Risk of Falls and Fall-Related Injury in Hospitalized Patients with CKD

Falls among hospitalized patients present a serious safety concern. Patients with chronic kidney disease (CKD) are at increased risk for falls due in part to generalized weakness, neuropathy, issues with blood pressure control, and difficulty regulating blood glucose level. Hospitalized patients with CKD initiating hemodialysis or experiencing complications related to being under dialyzed may be at risk for hemorrhage due to uremic anemia and/or albuminuria. Patients with CKD are also at increased risk for fracture related to CKD mineral bone disease or renal osteodystrophy.

At the virtual 2020 ANNA National Symposium, **Kimberly Gengler, RN-BC,** and colleagues at Cone Health, Greensboro, North Carolina, reported on a quality improvement project undertaken in an inpatient nephrology nursing unit to address the risk of falls among inpatients with CKD. The project was described in a session titled *Preventing Falls and Fall-Related Injuries for CKD Patients with "Blood and Bone" Risks on an Inpatient Nephrology Nursing Unit.*

The unit's nephrology nurses, support staff, unit leaders, nephrology clinical nurse specialist, and clinical nurse educator designed a plan to target patients at high risk for falls as well as to identify those at risk for a fall-related injury.

All patients identified as high risk for falls were placed in the Fall Prevention Bundle. The bundle included evidence-based interventions such as nonskid socks, the use of gait belts, bed and chair alarms, hourly rounding, and safety education. All patients identified as high risk for falls were screened for risk of fall-related injury. Patients with a risk of hemorrhage or bleeding (blood) and/or a risk of fracture (bone) were placed on the Injury Prevention Bundle that included use of specialty low beds, floor mats, and white board communication in patient rooms.

The authors reported that, "After implementation of these bundles, there was a significant decrease in falls and fall-related injuries. The fall rate went from 4.56 in 2018 to 2.98 in 2019, a 35% reduction. The falls with injury rate decreased from a rate of 0.99 in 2018 to 0.14 in 2019, an 86% reduction."

Source: Gengler K, Moore K, Young R, Johnson D, Kirkman A. Preventing falls and fall-related injuries for CKD patients with "blood" and "bone" risks on an inpatient nephrology nursing unit. Abstract of a presentation at the virtual 2020 American Nephrology Nurses Association National Symposium, August 29-31, 2020.

Reducing Hospital Admissions via the Emergency Department

Patients with end-stage renal disease (ESRD) require frequent hospitalization. Hospital admission via the emergency department (ED) can be time consuming and create the need for the patient to receive dialysis while still in the ED. At the virtual 2020 ANNA National Symposium, **Jenna Freeman, MSW,** of Patient Pathways, Denver, Colorado, and colleagues described a program aimed at reducing ED avoidable admissions in a session titled *Avoiding Admissions and Dialysis Treatments in the Emergency Department*.

The project began with the formation of a dedicated, multidisciplinary ED Avoidable Admissions Committee that included ED physicians, nephrologists, hospitalists, nursing and administrative staff, inpatient and outpatient administrators, and a dialysis-specific discharge planning group. The discharge planning group included a Patient Pathways care coordinator or case manager.

Avoidable reasons for ED admission of medically stable patients with ESRD include dialysis facility availability/delay issues, physician communication issues, patient or family refusal, nonadherence, and patient transportation issues. The committee defined a process aimed at a reduction in such admissions and dialysis treatments in the ED. The process also included an educational model for medical center clinicians.

Key steps in the process were ensuring the timely determination of medical necessity, coordination of transportation, and confirmation of availability of outpatient dialysis facility chair time. The program was implemented initially in a three-hospital system. Analysis of the number of patients receiving dialysis treatment in the ED found an 82% reduction over the four calendar quarters following program rollout.

"Implementation of a program to define and reduce avoidable admissions and unnecessary dialysis treatments in the ED resulted in a reduction in missed dialysis treatment in the outpatient setting, and improved ED throughput and cost savings to the hospital," the authors said.

Source: Freeman J, Benton S, Simmons S. Avoiding admissions and dialysis treatments in the emergency department. Abstract of a presentation at the virtual 2020 American Nephrology Nurses Association National Symposium, August 29-31, 2020.

Predictors of Nursing Care Activities Left Undone in Dialysis Units

There are few available data regarding the patterns and predictors of essential nursing care left undone in acute and chronic dialysis units, according to **Charlotte Thomas-Hawkins, PhD, RN, FAAN,** and **Linda Flynn, PhD, RN, FAAN,** of Rutgers University School of Nursing.

The researchers conducted a study designed to examine the patterns of nursing care left undone, RN staffing, workload, and practice environment support in acute and chronic dialysis units. The study also sought to examine the effects of RN staffing, workload, and practice environment support on nursing care left undone. Results of the study were reported during a virtual session at the 2020 ANNA National Symposium in a presentation titled *Patterns and Predictors of Nursing Care Left Undone in Acute and Chronic Dialysis Units*.

The study sample included 104 staff nurses working in acute and chronic dialysis units. The nurses completed a mailed survey. Based on responses to the survey staffing questions, patient-to-RN ratios were computed. The Individual Workload Perception Scale was used to measure RN workload. The Practice Environment Scale measured the practice environment support, and a Nursing Care Left Undone Inventory was used to measure nursing care activities left undone. The researchers conducted univariate, multivariate, and simple mediation analyses.

Nursing care activities left undone, high patient-to-RN ratios, and unsupportive practice environment ratings were significantly higher in chronic dialysis units compared with acute dialysis units. There was no statistically significant difference between the two unit types in RN workload.

In adjusted regression models, independent predictors of nursing care left undone were type of chronic dialysis unit (ß=.293; *P*=.003, high patient-to-RN ratios (ß=.461; *P*=.000), high RN workloads (ß=.443; *P*=.000), and unsupportive practice environments (ß=.434; *P*=.000). Following adjustment, only high patient-to-RN ratios (ß=.230; *P*=.02) and high RN workloads (ß=.308; *P*=.001) were independent predictors of undone nursing care activities. The effect of chronic dialysis unit type on nursing care left undone was mediated by practice environment support.

In conclusion, the authors said, "Improving RN staffing, reducing RN workloads, and improving practice environment support, particularly in chronic dialysis units, should be key initiatives to enhance the adequacy of nursing care processes in dialysis settings."

Source: Thomas-Hawkins C, Flynn C. Patterns and predictors of nursing care left undone in acute and chronic dialysis units. Abstract of a presentation at the virtual 2020 American Nephrology Nurses Association National Symposium, August 29-31, 2020.

Patient Understanding of Hyperkalemia and the Impact of Elevated Potassium on Quality of Life

Patients with chronic kidney disease (CKD) commonly experience hyperkalemia as a result of the pharmacologic treatment of CKD. However, **Adam Weinstein, MD,** and members of the Renal Physicians Association (RPA) Registry Workgroup, suggest that there are few data available on the impact of hyperkalemia from the perspective of the patient.

Using the RPA Kidney Quality Improvement Registry, the researchers recruited adult patients with CKD and hyperkalemia being treated in 11 nephrology practices in the United States. Inclusion criteria were serum potassium ≥5.2 mEq/L within the last 2 years, diagnosis of CKD, and proficiency in English. Exclusion criteria were chronic dialysis, kidney transplantation, and dementia.

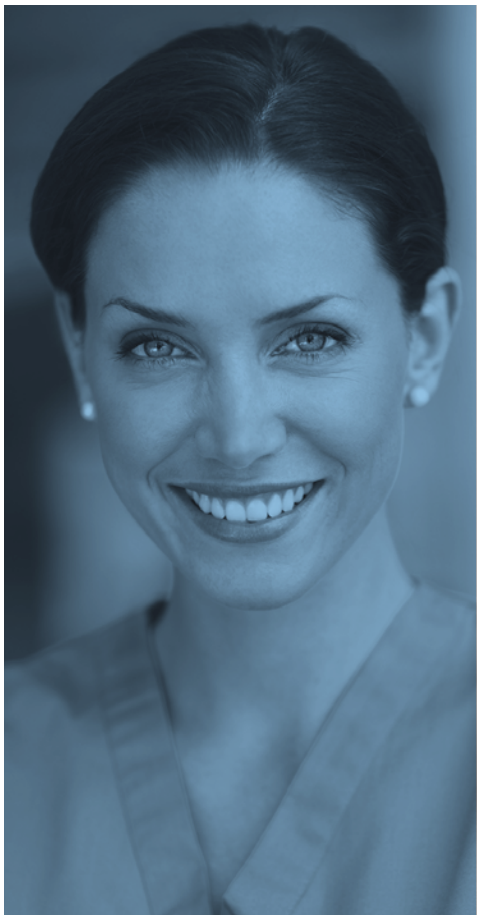
The researchers developed a 37-item survey that was administered to patients either during an office visit or online. The survey included questions related to patient awareness and experience with hyperkalemia and related treatment. Results of the survey were reported during a session at the virtual ANNA 2020 National Symposium in a presentation titled *Understanding the Impact of Elevated Potassium on Kidney Patients' Quality of Life and Treatment Experience from a Nephrology-Based Office Survey*.

A total of 302 patients completed the survey (response rate, 85%). Survey responses indicated that while 71% recalled discussing high potassium with a physician, only 57% understood the term hyperkalemia. Six percent of patients had been directed to an emergency department for hyperkalemia, 23% reported more frequent blood draws, and 48% reported feeling worried about the diagnosis.

The most common treatment recommendations followed by patients with hyperkalemia were diet changes (72%), initiation of medication (38%), cessation of medication or change in dose (28%). Respondents reported improvement with dietary change (48%) and new medication starts to lower potassium (33%). A majority of patients (60%) reported that improved potassium levels had a positive mental or physical impact on their lives.

"Understanding of hyperkalemia in adults with CKD experiencing this condition is relatively low despite conversations and a variety of intervention strategies used in partnership with their physicians. An occurrence of hyperkalemia negatively impacts their mental health and increases the need for more frequent diagnostic testing, yet its treatment improves their self-reported perceived quality of life," the researchers said.

Source: Weinstein A, Beckrich A, Singer D, et al. Understanding the impact of elevated potassium on kidney patients' quality of life and treatment experience from a nephrology-based office survey. Abstract of a presentation at the virtual 2020 American Nephrology Nurses Association National Symposium, August 29-31, 2020.



Conference Coverage

August 29-31, 2020

Depression Associated with Fatigue in Patients with ESRD

Among patients with end-stage renal disease (ESRD), fatigue is a prevalent and challenging symptom and is associated with decreased quality of life and increased mortality in that patient population. However, the causes of fatigue are not well understood.

Researchers, led by **Christine Horvat Davey, PhD, RN, CWRU,** conducted a study to examine the association between NPAS2 gene expression, demographic variables, dialysis specific factors, and medical characteristics with the phenotypic characteristic of fatigue among individuals with end-stage renal disease (ESRD). Results of the study were reported during a session at the virtual ANNA 2020 National Symposium in a presentation titled *Genetic Correlates, Demographic Factors, and Medical Characteristics Associated with Fatigue in Individuals with End-Stage Renal Disease*.

The cross-sectional, description study cohort included 122 patients with ESRD. Quantitative polymerase chain reaction was utilized to examine gene expression. The Fatigue Assessment Scale (FAS) and the Functional Assessment of Chronic Illness Therapy–Fatigue Scale (FACIT-F) were used to examine patient-reported fatigue. The data were analyzed using independent samples t-tests and multivariable regression analyses.

Of the 122 individuals in the cohort, 50% (n=61) were classified as having heavy fatigue as measured by the FAS and 29% (n=36) were classified as having heavy fatigue as measured by the FACIT-F scale. There was no significant association between gene expression of NPAS2 and the phenotype of fatigue. There was a significant association between the phenotype of fatigue and depression ($P<.0010$).

In conclusion, the researchers said, "This study suggests further research should examine the causal mechanism between depression and fatigue in order to identify genetic factors that could potentially explain the high comorbidity of depression and fatigue."

Source: Davey CH, Webel A, Voss J, Hsiao C-P, Sehgal A. Genetic correlates, demographic factors, and medical characteristics associated with fatigue in individuals with end-stage renal disease. Abstract of a presentation at the virtual 2020 American Nephrology Nurses Association National Symposium, August 29-31, 2020.

Increasing Competency with Ultrasound-Guided Cannulation

Both hemodialysis nurses and patients receiving care in hemodialysis centers share concerns regarding vascular access skillsets among nurses working in hemodialysis units. Based on clinical experiences, nurses may demonstrate varying levels of competency, knowledge, and skills. The resulting inconsistency in the way certain skills are performed is of particular concern in cannulation of arteriovenous fistula access and arteriovenous graft access.

At the virtual 2020 ANNA National Symposium, **Stella Salamat, MSN-Ed, BScN, RN, CNeph(C),** and colleagues reported results of a care-improvement project at an in-center hemodialysis unit in an presentation titled *Increasing Point-of-Care Nursing Competency by Utilizing Bedside Ultrasound for the Assessment and Cannulation of Hemodialysis Vascular Access*.

The center provides care for 415 patients; of those, 64.82% have central venous catheters (CVC), 27.23% have an arteriovenous fistula (AVF) or arteriovenous graft (AVG), and 7.95% have dual vascular accesses. The center has seen an increase in the use of CVC due to patients expressing fear of painful cannulation. There has also been an increase in the number of radiological procedures such as angioplasty, thrombolysis, angiogram procedures, and surgical revision for failed AVF/AVG.

The care-improvement project was designed to build capacity with the center's point-of-care nurses to be able to utilize portable ultrasound-guided cannulation, minimize vascular access complications secondary to traumatic cannulations, and reduce vascular access radiologic and surgical interventions.

The center distributed a preliminary survey to assess the nurses' competency in cannulation. Following assessment, gaps with inconsistent practices and access competency were minimized with an educational rollout ultrasound-guided cannulation. The educational program included an in-class component, team huddles, and hands-on training using a phantom model. To inform the educational program and training, the Visual, Auditory, Kinesthetic tool and vascular access proactive validation questionnaire were used to identify variation in learning styles. A total of 50 trained nurses were independently validated using the bedside portable ultrasound to evaluate cannulation technique.

The authors said, "With the interventions described above, the goal was to improve the level of competency with ultrasound-guided cannulation and minimize painful cannulation experiences for our hemodialysis patients. A post-intervention survey was provided to the nurses to assess competency in performing ultrasound-guided cannulation. In addition to the written evaluation, the clinical practice leader conducted one-on-one observation of trained nurses performing the procedure and provided immediate feedback to improve technique and success rate."

Source: Salamat S, Kaur H, Moonesar A. Increasing point-of-care nursing competency by utilizing bedside ultrasound for the assessment and cannulation of hemodialysis vascular access. Abstract of a presentation at the virtual American Nephrology Nurses Association 2020 National Symposium, August 29031, 2020.

Print-only Content

Results of analysis of the number needed to vaccinate found that overall 354 individuals should be vaccinated to avert one case of influenza-related hospitalization.

Influenza Vaccination Among Older Patients with Reduced Kidney Function

Each year, influenza results in 9.2 to 35.6 million illnesses in the United States, including 140,000 to 710,000 hospitalizations and 12,000 to 56,000 deaths. Recommendations from the Advisory Committee on Immunization Practices call for all adults to receive influenza vaccination, particularly those in vulnerable populations that include older adults and individuals with high-risk conditions. Conditions considered to be high risk for complications from influenza include chronic pulmonary (including asthma) or cardiovascular, kidney, hepatic, neurologic, hematologic, or metabolic disorders including diabetes mellitus.

Because 50% of hospitalizations related to influenza occur in adults ≥65 years of age, older age is a key risk factor. Chronic kidney disease (CKD) is related to age and affects more than 35% of older adults in the United States, and poses a higher risk factor for cardiovascular events and infections. Older adults with CKD are an important target in population-based vaccine policies.

However, there are few data available in the prevalence and relative effectiveness of influenza vaccine in older adults with reduced kidney function. **Junichi Ishigami, MD, MPH,** and colleagues conducted an observational cohort study to examine the prevalence and effectiveness of influenza vaccination among adults ≥65 years of age with and without reduced kidney function. The study participants were members of Geisinger Health System, a large community-based healthcare cohort. The researchers sought to test the hypothesis that there would be an association between influenza vaccination and reduced incidence of hospitalization related to influenza (pneumonia/influenza, coronary heart disease, and heart failure). Study results were reported in the *American Journal of Kidney Diseases* [2020;75(6):887-896].

The data represented 454,634 person-seasons among 110,968 individuals ≥65 years of age in the Geisinger Health System between the 2005 and the 2015 influenza seasons. Using inverse probability weighting, baseline characteristics were matched between those with and those without vaccination. The outcomes of interest were incident hospitalization with pneumonia/influenza, coronary heart disease, and heart failure during influenza season stratified by estimated glomerular filtration rate (eGFR) ≥60 mL/min/1.73 m^2, 30 to 59 mL/min, 1.73 m^2, and <30 mL/min/1.73 m^2.

Characteristics were overall comparable between the 2005-2006 and 2014-2015 influenza seasons. Of the 55,211 individuals in the 2014-2015 influenza season, mean age was 75.5 years, 57.7% were women, and 0.8% were Black. Thirty-one percent had eGFR of 30 to 59 mL/min/1.73 m^2 and 2.8% had eGFR <30 mL/min/1.73 m^2. The prevalence of comorbid conditions was diabetes 27.0%, coronary heart disease 19.9%, chronic obstructive pulmonary disease (COPD)/asthma 20.4%, cancer 15.5%, and cerebrovascular disease 11.6%.

In the unweighted sample, individuals who received influenza vaccination were more likely to have diabetes, coronary heart disease, COPD/asthma, cancer, cerebrovascular disease, and heart failure, but less likely to have dementia. Those in the vaccination cohort also had more frequent outpatient visits and hospitalizations compared with those who did not receive influenza vaccination. Following inverse probability weighting, the differences became substantially smaller and baseline variables were similar between the cohorts that did and did not receive an influenza vaccination.

In the 2005-2006 influenza season, the prevalence of influenza vaccination was 53.3%; the prevalence remained largely constant between 60% and 66% from 2006 through 2015. There were nominal differences across eGFR categories in the prevalence of vaccination. In the 2014-2015 influenza season, for the eGFR categories ≥60, 30 to 59, and <30 mL/min/1.73 m^2, the prevalence of vaccination was 62.9%, 64.5%, and 57.3%, respectively. In the subgroups with and without diabetes, there was ~10% higher prevalence of vaccination among individuals with diabetes. Of those who received an influenza, 99% received a standard dose.

During 442,417 person-seasons among 109,096 individuals, there were 3709 hospitalizations with pneumonia/influenza, 12,842 with coronary heart disease, and 6543 with heart failure. The incidence per person-season among those who did not receive influenza vaccination was 0.9%, 2.9%, and 1.5%, respectively. The incidence was disproportionally higher in lower eGFR categories for each outcome (eg, 2.2% among those not vaccinated with eGFR <30 mL/min/1.73 m^2 vs 0.7% with eGFR ≥60 mL/min/1.73 m^2 for pneumonia/influenza).

There was an association between influenza vaccination and ~10% lower odds of hospitalization for pneumonia/influenza (odds ratio [OR], 0.86; 95% confidence interval [CI], 0.79-0.93), coronary heart disease (OR, 0.93; 95% CI, 0.88-0.97), and heart failure (OR, 0.92; 95% CI, 0.86-0.99). When assessed by eGFR category, the association was generally consistent in eGFR ≥30 mL/min/1.73 m^2, but not significant in eGFR <30 mL/min/1.73 m^2.

Results of analysis of the number needed to vaccinate found that overall 354 individuals should be vaccinated to avert one case of influenza-related hospitalization. When numbers needed to vaccinate were estimated by eGFR of 30 to 59 mL/min/1.73 m^2 versus ≥60 mL/min/1.73 m^2, the numbers needed to vaccinate were lower in eGFR 30 to 59 mL/min/1.73 m^2 compared with ≥60 mL/min/1.73 m^2.

Limitations to the study cited by the authors included possible residual confounding and selection by identification, relying on *International Classification of Diseases-Ninth Edition* codes to determine the outcome that could have led to misclassification, the possibility that some individuals may have been vaccinated outside the Geisinger system, and analyzing the effectiveness only among those who stayed at risk until December 1.

The researchers said, "In conclusion, one-third of older adults did not receive an influenza vaccination even when eGFRs were low. Because our study confirmed a reduced incidence of hospitalizations among older adults with GFR ≥30 mL/min/1.73 m^2 receiving influenza vaccination, it is important to improve adherence to influenza vaccination in this population. This is particularly critical for older adults with eGFR of 30 to 59 mL/min/1.73 m^2 given their low number needed to vaccinate. The lack of evident effectiveness of influenza vaccination in eGFR <30 mL/min/1.73 m^2 warrants future studies to determine the optimal influenza prevention strategies in this high-risk population." ■

TAKEAWAY POINTS

- Researchers conducted an observational cohort study to examine the effectiveness of influenza vaccination among older adults with and without reduced kidney function.
- The prevalence of influenza vaccination was 53.3% in 2005-2006 and then remained largely constant between 60% and 66% from 2006 through 20215.
- The incidence of hospitalization was higher in patients with lower estimated glomerular filtration rate (eGFR): 2.2% per person-season among those not vaccinated with eGFR <30 versus 0.7% with ≥60 mL/min/1.73 m^2 for pneumonia/influenza.

MTM Reduces Risk of 30-Day Readmission among Dialysis Patients

Patients with end-stage renal disease being treated with maintenance hemodialysis are medically complex and commonly have multiple comorbid conditions that require on average 10 to 12 medications. Individuals in that patient population experience nearly two hospitalizations per year, with 35% resulting in readmission. Medication changes are common during transitions of care and may result in patient confusion related to which medications to continue, stop, or modify.

In the general population, 20% of adults experience an adverse event follow hospitalization discharge, and 21% of 30-day readmissions are medication related; 69% of those readmissions are preventable. Results of studies among the general population suggest that multidisciplinary medication therapy management (MTM) services involving pharmacists and nurses for discharge planning, medication reconciliation, and postdischarge follow-up reduce rehospitalization. There are few data on the impact of such services in the dialysis population.

Harold J. Manley, PharmD, and colleagues conducted a retrospective observational cohort study designed to examine the association of a multidisciplinary MTM program with 30-day readmission rates among patients receiving maintenance hemodialysis. Results were reported in the *American Journal of Kidney Diseases* [2020;76(1):13021].

The study cohort included patients on maintenance dialysis discharged to home from acute-care hospitals between May 1, 2016, and April 30, 2017, who returned to End-Stage Renal Disease Seamless Care Organization (ESCOs) dialysis clinics after discharge. In the Centers for Medicare & Medicaid Services Innovation Comprehensive End-Stage Renal Disease Care Model, ESCOs are incentivized to provide coordinated comprehensive care by making stakeholders responsible for hospitalization costs. ESCO quality measures include hospital readmission rates and medication reconciliation postdischarge. Dialysis Clinic, Inc-affiliated ESCOs (DCI-ESCO) developed and implemented a multidisciplinary MTM intervention. The study assessed the effect of the program on 30-day readmission rates.

The study included 27 dialysis clinics across four states (New Jersey, New York, Tennessee, and South Carolina). During the study period, there were 1732 hospital discharges to home: 51% (n=373) had one discharge; 25% (n=181) had two discharges; 11% (n=82) had three discharges; and 12% (n=90) had four or more discharges. Following application of exclusion criteria, 84% of the total discharges (n=1452 in 726 patients) were included in the analyses.

Three DCI-ESCOs contributed 32.9%, 38.8%, and 28.2% of unique patients. Overall, 60% (n=866) of discharges received some level of medication reconciliation. In 41% of discharges (n=595), pharmacist review was provided, and in 34% (n=492) nephrologist review of pharmacist recommendation(s) was provided.

Of the 866 discharges with some level of medication reconciliation, 47% (n=409) had 100% medications reconciled, 31% (n=269) had pharmacist review, and 19% (n=162) had both pharmacist review and nephrologist review of the recommendations within 30 days of discharge. Various combinations of MTM process steps and the timeliness of implementation resulted in full or partial MTM services in 11% (n=162) and 48% (n=704) of the total 1452 discharges included in the analysis, respectively.

Full MTM discharge was defined as completion within 30 days after discharge. Of the 162 full MTM discharges, the mean time to completion of the process was 12 days, including 4 days for nurse medication reconciliation, 2 days for pharmacist medication review and sending recommendations to a nephrologist, and 6 days for nephrologist review, sign off, and return of the action plan.

Mean age of the patients in the analysis cohort was 64 years and 56% had diabetes. Patients experienced a mean of two discharges, each with a mean length of stay of 7 days. At 30 days postdischarge, the number and type of discharge diagnoses were similar among MTM groups. Analysis of facility-level impact demonstrated that for every 0.1 greater facility standardized hospitalization rate, hospitalization rate was greater by 8% (hazard ratio [HR], 1.08; 95% confidence interval [CI], 1.00-1.17).

The analysis identified 5466 potential medication-related problems. The top three potential medication-related problems were issues regarding dosing (31%, n=1697), including dose too high for 22% (n=1202) and dose too low for 9% (n=495); real or potential adverse drug reaction (29%, n=1570); and unnecessary drug therapy (17%, n=928).

The top four medication classes were cardiovascular (18%, n=980), gastrointestinal (15%, n=825), analgesic (12% (n=635), and endocrine and metabolic drugs (10%, n=553). Those top four classes accounted for 55% of pharmacist recommendations. Within each medication class, calcium channel blockers (n=145), proton pump inhibitors (n=149), insulins (n=250), and salicylates (n=165) were associated with most potential problems related to medications.

Percentages of 30-day readmissions among full-, partial-, and no-MTM patients were 11% (n=17), 19% (n=135), and 29% (n=170), respectively ($P<.001$). During the follow-up period, there were 323 readmissions of the 1452 discharges (22%); the majority of those occurred 15 to 21 days after discharge. Compared with patients in the no-MTM group, those in the full- and partial-MTM groups had fewer readmissions within 30-days after discharge. Patients in the full-MTM group had the lowest risk of 30-day readmission (HR, 0.26; 95% CI, 0.15-0.45).

The risk of 30-day readmission was also

lower among patients in the partial-MTM group compared with those in the no-MTM group (HR, 0.50; 95% CI, 0.37-0.68). Within the partial-MTM group, 30-day readmission rates for discharges that received medication reconciliation only (47%, n=333) and medication reconciliation and pharmacist review (53%, n=371) were 17% and 21%, respectively (*P*=.09).

The authors cited some limitations to the study findings, including the retrospective observational design of the study, the inclusion of varied time frames with which patients received the MTM intervention, possible confounding by health status, and the possibility that results are not generalizable to the US dialysis population due to ESCO infrastructure for patient care that may exceed that in other dialysis facilities.

In conclusion, the researchers said, "Using a model of centralized clinical pharmacists with access to clinical data and documentation working in collaboration with local nurses and nephrologists to provide in-depth patient-specific medication reviews, our findings suggest a significant reduction in risk for 30-day readmission for patients receiving MTM. Randomized controlled studies evaluating different MTM delivery models and cost-effectiveness in dialysis populations are needed." ■

Facility-Level Comorbidity Burden and Use of AVF Access

The preferred access type for patients receiving maintenance hemodialysis is arteriovenous fistula (AVF). Compared with tunneled catheters or arteriovenous grafts, AVFs are associated with superior patency, lower rates of infection, and reduced mortality. During the past decade, use of AVFs has increased; however, there are concerns about vascular access options in patients with higher comorbidity burden.

Previous studies have shown that patient comorbid conditions and factors such as female sex, Black race, and older age are associated with lower AVF use. Nevertheless, some centers have high rates of AVF placement even among patients with multiple comorbid conditions. **Claudia Dahlerus, PhD,** and colleagues conducted a retrospective cohort study designed to use both incident and prevalent comorbid conditions to stratify dialysis facilities based on their overall comorbidity burden vis-à-vis the association with facility-level AVF use. To compare the impact of patient- versus facility-level comorbidity on AVF use, the researchers conducted both patient- and facility-analyses. Results of the study were reported in the *American Journal of Kidney Diseases* [2020;75(6):879-886].

The study participants were Medicare beneficiaries receiving hemodialysis for 1 year or more in dialysis facilities in the United States. The researchers utilized Centers for Medicare & Medicaid Services Medicare claims and clinical and administrative data from CROWNWeb for 5813 US dialysis facilities with 11 or more patients from September 2014 through August 2015.

Study predictors were facility-level burden of patient comorbid conditions and patient characteristics. For the patient-level analysis, the outcome of interest was AVF use as the sole vascular access at the end of each reporting month in the study period. For the facility-level analysis, the primary outcome was the monthly percentage of AVF use (defined as the total number of AVFs in use divided by the total number of patient-months at each facility) at the end of the reporting month. An AVF was considered the sole vascular access if it was in use for the last treatment of the reporting month with two needles (or one needle with an approved single-needle device) and no catheter present. A long-term catheter was defined as present if the catheter was in use on the last treatment of the reporting month and the prior 2 months.

The study population included 315,919 prevalent hemodialysis patients (3,072,080 patient-months) at the 5813 eligible dialysis facilities. On average, the number of comorbid conditions per patient-month was progressively greater with greater facility comorbidity burden (range, 2.1-5.1). Compared with facilities with low comorbidity burden, those with high comorbidity burden had older patients (65.1 years vs 61.8 years), a higher proportion of female patients (45.8% vs 44.3%) and patients with a nursing home stay in the previous year (14.5% vs 6.6%), and lower proportions of Black patients (28.8% vs 39.5%). There was no significant difference between the two groups in the proportion of Hispanic patients (13.9% vs 14.0%).

In each of the comorbidity groupings, diabetes and heart disease were most prevalent. In the lowest comorbidity burden facilities, 50.9% of patients had diabetes and 42.6% had cardiovascular disease; in the facilities with the highest comorbidity burden, 82.0% had diabetes and 88.0% had cardiovascular disease. Overall, the prevalence of peripheral vascular disease was 47.9% (range, 26.1% in the lowest comorbidity burden facilities to 73.2% in the highest comorbidity burden facilities).

The overall percentage of AVF use was 65.8% (67.1% in the low and 63.9% in the high comorbidity facilities, respectively). The highest comorbidity burden facilities (>99th percentile) had the lowest percentage of patients with an AVF (55.2%). The mean percentage of patients with a long-term catheter was lowest in the low comorbidity burden facilities (9.5%) and highest in the highest comorbidity burden facilities (18.5%).

Results of patient-level analysis showed significant associations between younger age, non-Black race, male sex, Hispanic ethnicity, higher body mass index, and prior nephrology care with higher odds of AVF use. Patients aged 25 to 29 years of age had 6% higher odds of an AVF than patients 60 to 75 years of age. Having nephrology care prior to dialysis initiation was associated with a 22% higher odds of an AVF. Patient factors associated with lower odds of an AVF included age of ≥75 years, a nursing home stay in the prior year, and dialysis vintage of ≥5 years.

In facility-level analysis, facility-level AVF use differences between comorbidity burden groups were adjusted for average patient characteristics within the same facility. Greater facility-level comorbidity burden from the 61st to the 99th deciles was associated with progressively lower AVF use. Facilities with lower comorbidity burden were associated with small but steadily greater AVF use. The lowest comorbidity burden was associated with 2.64 percentage point greater facility-level AVF use. Following adjustment for comorbid conditions, the associations of other patient factors such as age, sex, race, and ethnicity were markedly attenuated.

There were some limitations to the findings cited by the authors, including limiting the study population to the Medicare population on maintenance dialysis for ≥1 year, and not accounting for facility characteristics such as geographic location, size, staffing ratios, or ownership characteristics.

"In summary, we demonstrate that there is little variation in dialysis facility AVF use across a spectrum of comorbidity burden, suggesting that other factors such as facility practice patterns likely play an important role in determining rates of AVF use." ■

TAKEAWAY POINTS

- Patients with high comorbidity burden are less likely to use an arteriovenous fistula (AVF) for hemodialysis vascular access; researchers conducted a retrospective cohort study to examine variation in facility-level use of AVFs across a facility-level burden of patient comorbid conditions.
- The cohort included Medicare beneficiaries receiving maintenance hemodialysis for 1 year or longer.
- Following adjustment for patient characteristics, there were only small differences in facility rates of AVF use with the exception of high or low levels of comorbidity burden.

APOL1 Genotyping in Living Kidney Donor Evaluation

Recipients of a transplant kidney from a living donor are more likely to remain dialysis free with functioning allografts for longer durations compared with recipients of a kidney from a deceased donor. Transplant physicians are obligated to provide for the safety and long-term well-being of living kidney donors. For medically complex donors, evaluation for living kidney donation can be challenging for the donor candidates, transplant recipients, and families. Donors assume short-term perioperative and long-term medical risk.

Risks for donors are low, but they do exist, according to **Alexandra M. Mena-Gutierrez, MD,** and colleagues at the Wake Forest School of Medicine, Winston-Salem, North Carolina. There is no perfect candidate and each transplant program determines the acceptable level of risk for their living donors. The rise of genomic medicine has provided benefits to organ transplantation, making it relatively simple to screen asymptomatic potential living kidney donors to determine whether the donor has risk variants in genes that have known association with chronic kidney disease (CKD) and subsequently avoid donation.

The apolipoprotein L1 gene (*APOL1*) is associated with nondiabetic CKD and end-stage renal disease (ESRD) in Africans, African Americans, Brazilians, and Afro-Caribbeans. *APOL1* high-risk genotypes in deceased organ donors contribute to more rapid failure of kidneys transplanted from African-American donors. Further, a higher risk for developing post-donation CKD in living kidney donors with recent African ancestry has been seen in donors with *APOL1* high-risk genotypes.

Awareness of the effects of *APOL1* in kidney transplantation has increased among transplant physicians, nephrologists, patients with ESRD, and potential living donors. While the proportional rates of deceased donor kidney transplantation for African American recipients are equitable, there remain disparities in the incidence of living kidney donor transplants in that patient population. Dr. Mena-Gutierrez et al. reviewed genetic testing for inherited kidney disease in living kidney donors to improve donor safety; the article includes consideration of *APOL1* genotyping in donors with recent African ancestry [*Transplantation*. 2020;104(1):27-32].

TAKEAWAY POINTS

- The association between the apolipoprotein L1 gene (*APOL1*) and nondiabetic chronic kidney disease is key in nephrology care and in evaluation of donor kidneys for transplantation.
- In candidates for living kidney donation who self-report recent African ancestry, researchers suggest genetic testing for inherited kidney disease to improve donor safety.
- The transplant program at the Wake Forest School of Medicine provides education about *APOL1* in kidney disease and offers genetic testing to potential donors of recent African ancestry.

SCREENING FOR INHERITED KIDNEY DISEASES

Donor candidates should be informed by the transplant team regarding the potential for genetic predisposition to kidney disease. For kidney donors with a family history of potentially inherited forms of kidney disease in two or more members, genetic testing should be considered. In cases where the extended family history is uncertain, genetic testing can be considered with one affected first-degree relative.

COUNSELING ABOUT *APOL1*

Until results of APOLLO are reported, transplant programs should develop local guidelines to inform potential living donors who self-report African ancestry about the role of *APOL1* in kidney disease and outcomes following donation and transplantation. At present, there is no policy for universal testing of at-risk living donors for *APOL1* at transplant programs in the United States. Further, the *APOL1* genotypes are not part of the donor evaluation process.

Awareness of the effects of *APOL1* in kidney transplantation has increased among transplant physicians, nephrologists, patients with ESRD, and potential living donors.

APOL1 TESTING

A study in Detroit, Michigan, assessed long-term outcomes in 136 African American living kidney donors. As in the general population, 14% had *APOL1* high-risk genotypes (with two renal risk variants) and 86% had low-risk genotypes (0/1 renal risk variant). After 12 years of follow-up, 11% of previously healthy kidney donors with *APOL1* high-risk genotypes developed ESRD and 67% developed an estimated glomerular filtration rate <60 mL/min/1.73 m^2. Based on those case reports, the reviewers hypothesized that "premature transplant failure could also occur in some recipients of *APOL1* high-risk living kidney donors."

In recipients of deceased donor kidney transplants, outcomes are similar. Kidneys transplanted from *APOL1* high-risk donors fail more quickly. Currently, the Kidney Allocation System downgrades quality in all African American deceased donor kidneys regardless of *APOL1* genotype, although recent data suggest that those with two *APOL1* renal risk variants (~13%) may be at highest risk for early allograft failure. The ongoing *APOL1* Long-term Kidney Transplant Outcomes Network (APOLLO) and the APOLLO Ancillary Study, Living Donor Extended Time Outcomes, will provide additional data.

The reviewers said, "Kidney transplant programs evaluating African American living donor candidates should become familiar with the effects of *APOL1* and consider offering *APOL1* and non-*APOL1* genetic testing. If programs lack individuals comfortable with these processes, other transplant programs and Clinical Laboratory Improvement Amendments-certified *APOL1* laboratories could assist.

"Prospective results from the APOLLO Study will ideally clarify best practices. Until then, we recommend education about *APOL1* in kidney disease and the offer of genetic testing in kidney donor candidates who self-report recent African ancestry. Our program does not typically proceed with living kidney donation from individuals with two *APOL1* risk variants under the age of 60 years. In addition, we treat *APOL1* genetic data in a similar fashion as genotypes for other inherited kidney diseases. We provide education and offer genetic testing and counseling. In our opinion, these practices provide potential kidney donors with the ability to make the most informed and safest decision." ■

Using Kidneys from HCV-Viremic Donors Is Cost-Effective

There are approximately 103,000 patients waitlisted for a kidney transplant in the United States; in 2018, only 14,725 patients received a deceased-donor kidney transplant. The scarcity of available kidneys for transplantation and the high mortality rate among patients awaiting transplant have led to interest in transplanting organs that might have been considered ineligible, including kidneys from hepatitis C virus (HCV) antibody-positive donors.

Discard rates of HCV-viremic kidneys are declining; however, approximately 39% of HCV-viremic kidneys donated between 2018 and 2019 were discarded. Chronic HCV infection can be managed with the highly effective antiviral agents that are now available. **Mark H. Eckman, MD, MS,** and colleagues conducted a study to examine the cost-effectiveness of transplanting kidneys from HCV-viremic donors into HCV-uninfected recipients. Results of the study were reported in the *American Journal of Kidney Diseases* [2020;75(6):857-867].

The study utilized the Markov state transition decision model. Data sources included research of a Medline search, bibliographies from relevant English language articles, the Scientific Registry of Transplant Recipients, and the US Renal Data System. The study population included US patients receiving maintenance hemodialysis and on kidney transplant waiting lists. Study interventions were transplantation with an HCV-unexposed kidney versus transplant with an HCV-viremic kidney and HCV treatment. The outcomes of interest were effectiveness measured in quality-adjusted life-years (QALYs) and costs measured in 2018 US dollars.

Results of a nondiscounted base-case analysis demonstrated that transplantation with an HCV-viremic kidney improved survival by 1.19 QALY.

The study included extensive sensitivity analyses. As transplantation with HCV-viremic kidneys becomes more widely accepted over the coming years, the waiting time for transplant with such an organ will decrease. In the base case, the average waiting list time for an HCV-viremic kidney is 1.56 years, while the wait for an uninfected kidney is 4 years. Results of sensitivity analyses demonstrate that transplantation with an HCV-viremic kidney continues to result in a gain in quality-adjusted survival as long as the average waiting time is less than 3.79 years (<1383 days), corresponding to a decrease in waiting time of at least 0.21 year (77 days) given the average waiting time for an uninfected kidney is 4 years.

The researchers conducted a two-way sensitivity analysis of waiting list time for an HCV-viremic kidney and annual excess rate post-transplant of an HCV-viremic kidney. That analysis was designed to explore the possibility that HCV-viremic kidneys from young otherwise healthy donors dying from opioid drug overdose may be of higher quality, thus decreasing the annual excess mortality attributable to transplantation. Analysis results suggested that if the excess annual mortality following receipt of such a kidney is actually lower than that of the average kidney transplant (0.02/year), transplantation with an HCV-viremic kidney may still be the better strategy even for longer wait list times. Conversely, if future experience with transplantation of HCV-viremic kidneys suggest higher than average annual excess mortality, shorter waiting list times will be necessary to make this strategy optimal.

In economic analysis, transplantation with an HCV-viremic kidney improved survival by 0.91 QALY at a lifetime cost savings of $37,918 compared with a strategy of kidney transplantation with an HCV-unexposed kidney. In nondiscounted analysis, compared with transplantation of an HCV-unexposed kidney, transplantation with an HCV-viremic kidney improved survival by 1.19 QALY at a lifetime cost savings of $45,651.

Results of multiple one-way sensitivity analyses suggested that while transplanting an HCV-viremic kidney is cost saving and more effective in the base case, beyond a waiting list time of 2.67 years (975 days), transplantation with an HCV-viremic kidney is no longer cost saving, but remains highly cost-effective (incremental cost-effectiveness ratio < $50,000 per QALY) unless the wait time exceeds 3.1 years (1132 days). These results correspond to an additional wait list time of 0.9 year (329 days) compared with receipt of an HCV-unexposed kidney. The wait list time for an HCV-unexposed kidney is 4 years.

The parameter that had the most impact on the economic analysis was the cost of direct-acting antiviral (DAA) treatments for HCV infections. In the event that the cost for DAA regimens decreases to $7000 per month (from the base case value of $9830), the cost savings associated with transplantation of HCV-viremic kidneys would increase to $44,671.

The parameter that had the most impact on the economic analysis was the cost of direct-acting antiviral (DAA) treatments for HCV infections.

There were some limitations to the findings cited by the authors, including estimating wait list times for patients willing to accept an HCV-viremic kidney based on data for patients who received HCV-viremic kidney transplants, and performing the analysis from the perspective of HCV-uninfected individuals considering transplantation.

In summary, the researchers said, "The tragedy of the opioid epidemic has resulted in potential donors who are younger and have few other medical comorbid conditions beyond chronic HCV infection. Using these kidneys to decrease waiting times can result in improved survival and cost savings. However, waiting times vary dramatically from patient to patient and from center to center. As shown in our scenario analyses for individual patients, transplantation of HCV-viremic kidneys in patients with shorter waiting times for HCV-unexposed kidneys may not result in a new benefit. What is needed is a decision support tool that can aid patients and their physicians in making the best choice, based on waiting time estimates for both HCV-unexposed and HCV-viremic kidneys using patient-specific clinical, demographic, and center-specific information. One could imagine using these individualized predictions, along with individual patient values and preferences for health states such as life on dialysis or after kidney transplantation with an HCV-viremic or HCV-unexposed organ, to inform a decision analytic model, such as that described in this study. The day is not far off when decisions to use previously discarded HCV-viremic kidneys can be optimized for individual patients through data-informed shared decision-making discussions using such tools." ■

TAKEAWAY POINTS

- Fewer than 4% of patients with kidney failure receive kidney transplantation due to a scarcity of available kidneys. Approximately 39% of hepatitis C virus (HCV)-viremic kidneys donated between 2018 and 2019 were discarded.
- Researchers used the Markov state transition decision model to examine the cost-effectiveness of transplanting kidneys from HCV-viremic donors into HCV-uninfected recipients.
- Compared with transplanting kidneys from HCV-unexposed donors, using HCV-viremic kidneys increased quality-adjusted life expectancy and reduced costs.

Conference Coverage

September 13 - 16, 2020

28TH INTERNATIONAL CONGRESS OF THE TRANSPLANTATION SOCIETY

The Transplantation Society provides global leadership in the practice of human transplantation and works to establish guidelines of clinical practice, advance programs of education, and promote ethical standards for clinical care and scientific investigation.

The Society has more than 6700 members in more than 105 countries with an active interest in basic science, clinical research, and/or improving clinical practice in the field of transplantation.

The Society's International Congress is held every two years. Due to the pandemic, the 28th International Congress (TTS2020) was held virtually from September 13 to 16, 2020.

BK Virus Nephropathy and Risk of Allograft Function and Survival

BK virus-associated nephropathy (BKVAN) is associated with allograft dysfunction and graft failure in kidney transplant recipients. Reduction of immunosuppression is the gold standard of treatment for BKVAN, possibly increasing the risk for acute rejection.

Researchers in South Korea, led by **Ji Won Min, MD,** utilized data from the Korean Organ Transplantation Registry, a nationwide organ transplantation database, to compare graft function and allograft survival in patients with BKVAN with or without biopsy-proven acute rejection (BPAR). Results of the analysis were reported during a virtual poster session at the 28th International Congress of the Transplantation Society in a poster titled *Differential Impact of Allograft Rejection on Kidney Transplant Patients with BKV Infection.*

Of the 5403 kidney transplant recipients who underwent transplantation between 2014 and June 2019, 97 were diagnosed with BKVAN. Of those, 27% (n=26) developed BPAR within 5 months of the diagnosis of BKVAN; 71 patients did not develop BPAR. At baseline, both groups (with and without BPAR) had similar characteristics, immunosuppression treatment, and treatment methods for BKVAN.

In the BPAR group, there was a significant decrease in allograft function compared with the group without BPAR at both the 1 year and 2 year follow-up period (BPAR creatinine [Cr] 2.5 vs no BPAR Cr, 1.9; *P*=.044 and BPAR Cr 3.8 vs no BPAR Cr 2.2; *P*=.015, respectively). Allograft survival rates were lower in the BPAR group than in the no-BPAR group; however the difference did not reach statistical significance (*P*=.474).

In multivariate Cox regression analysis, discontinuation of mycophenolate mofetil (MMF) was seen as a significant risk factor for rejection in patients with BKVAN (hazard ratio, 4.000; 95% confidence interval, 1.014-15.775; *P*=.048).

In conclusion, the researchers said, "Acute rejection with BKVAN is associated with poorer allograft function and survival. Also, discontinuation of MMF as treatment for BKVAN increases risk for acute rejection."

Source: Min JW, Jun KW, Park JB, et al. Differential impact of allograft rejection on kidney transplant patients with BVK infection. Abstract of a poster presented at the virtual 28th International Congress of the Transplantation Society (Abstract P-11.55), September 13-16, 2020.

Complications after Pediatric Transplant Surgery

Pediatric patients with end-stage kidney disease treated with kidney transplantation have improved quality of life and prolonged life expectancy. **Aydincan Akdur, MD,** and colleagues at Baskent University, Ankara, Turkey, conducted a study to examine surgical complications following pediatric kidney transplantation. Results of the study were reported during a virtual poster session at the 28th International Congress of the Transplantation Society in a poster titled *Surgical Complications after Pediatric Kidney Transplantation.*

Of the 3080 kidney transplantation procedures performed at two centers by the same transplantation team from November 1975 to November 2019, 355 of recipients were children (≤18 years of age). The medical records of the 355 patients were used to obtain data on primary cause of kidney failure, patient age and weight at time of transplantation, type of graft, and clinical outcomes of both recipient and donor.

Of the 355 procedures, 31.9% (n=113) were deceased donor transplantation and 68.1% (n=242) were living donor transplantation. The centers perform renal arterial anastomoses and ureteral anastomoses by means of a corner saving technique. There was no major donor morbidity or donor mortality in the study cohort.

A total of 215 of the patients were girls, and mean age was 13.6 years. During the early postoperative period, there were two cases of renal artery thrombosis, one of renal artery kinking, two renal vein thrombosis, and two renal vein kinking. Six patients underwent surgery for vascular complications. Thrombectomy was performed for patients with renal artery thrombosis and renal vein thrombosis. The position of the grafts was changed for the patients with renal artery kinking and renal vein kinking. Double J stent was not used during transplant surgery for the six patients.

During the late follow-up period, renal arterial stenosis was identified in three patients who were managed with percutaneous angiography and stenting. The incidence of symptomatic lymphoceles following pediatric kidney transplantation at the center has been 4.2%. Percutaneous drainage was used for the treatment of lymphocele.

Five-year patient survival rates were 91.9%. There was no association between surgical complications and mortality.

In conclusion, the researchers said, "Graft survival dramatically increased over the past years and is now superior to those observed in adult kidney transplantation, particularly in experienced teams with microsurgery skills."

Source: Akdur A, Baskin E, Ersoy Z, Moray G, Haberal MA. Surgical complications after pediatric transplantation. Abstract of a poster presented at the virtual 28th International Congress of the Transplantation Society (Abstract P-11.78), September 13-16, 2020.

In the biposy-proven acute rejection (BPAR) group, there was a significant decrease in allograft function compared with the group without BPAR at both the 1-year and 2-year follow-up period.

Ischemic Times and 1-Year Outcomes in Kidney Transplantation

Previous studies have examined the effects of cold and warm ischemia times on graft function following kidney transplantation. Results of those studies have suggested that extended cold ischemia time (CIT) or extended warm ischemia time (WIT) were independently adversely associated with graft survival. However, according to **Christopher Seet, MD,** and colleagues at the Royal London Hospital, London, United Kingdom, there are few data available on analyses of both cold and warm ischemia times.

Dr. Seet et al. conducted an analysis to determine whether there is a significant association between a composite measure of cold and warm ischemic time and graft function. Results of the study were reported during a virtual poster session at the 28th International Congress of the Transplantation Society in a poster titled *Effect of Cold, Warm, and Composite Ischaemic Times on One Year Graft Function.*

The analysis included all kidney transplants conducted at the Royal London Hospital between April 2017 and March 2018. Cases where CIT, WIT, or 1-year creatinine measurements were not available were excluded. The final analysis cohort included 107 cases. Cutoffs of 15 hours for CIT and 35 minutes for WIT were used.

The analyses compared mean 1-year creatinine for cohorts with long versus CIT and long versus short WIT. The effect of CIT and WIT on delayed graft function was examined. In addition, cases were stratified into four groups based on length of CIT and WIT: low CIT/low WIT; low CIT/high WIT; high CIT/low WIT; or high CIT/high WIT. Mean 12-month creatinine levels between each group were compared.

In the overall cohort, there were a relatively small number of patients with long CIT >15 hours (n=17) compared with CIT <15 hours (n=86). However, an extended CIT of 15 hours had a significantly increased mean creatinine level at 12 months post-transplant compared with CIT <15 hours (173 vs 148 mmol/L; *P*=.02). Grafts with WIT >35 minutes also had significantly raised creatinine compared with WIT <35 minutes (64 vs 131 mmol/L; *P*=.006).

Following stratification into the four groups, there was a significant difference in mean creatinine in grafts with long CIT/long WIT compared with the other groups. There was no difference in mean creatinine among the other groups. The groups were also similar in delayed graft function.

The differences in high CIT/high WIT and high CIT/low WIT were greatest (mean difference 87 mmol/L; *P*=.012), followed by low CIT/low WIT (76 mmol/L; *P*=.001), and low CIT/high WIT (mean difference 53 mmol/L; *P*=.04). At 1 year post-transplantation, the worst graft function was associated with an extended cold and warm ischemia time; however, the results suggest that WIT may have a greater impact on long-term function than CIT.

"The durations of WIT and CIT have previously been shown to adversely affect graft function. A composite measure of CIT and WIT may be useful in predicting longer term outcomes in kidney transplantation. Our study suggests that WIT has a greater impact on graft function than CIT, and that maintaining CIT <15 hours and WIT <35 minutes is associated with improved one year creatinine," the authors said.

Source: Seet C, Shetty S, Chowdary P, Mohamed IH, Khurram M. Effect of cold, warm, and composite ischaemic times on one year graft function. Abstract of a poster presented at the virtual 28th International Congress of the Transplantation Society (Abstract P-11.70), September 13-16, 2020.

Outcomes Associated with Pancreas Transplant in Patients with CKD and Type 1 Diabetes

Both pancreas transplantation alone (PTA) and islet cell transplantation (ICT) have been associated with perioperative declines in estimated glomerular filtration rate (eGFR), a decline that is less than that associated with medically managed diabetes. According to **Rashikh Choudhury, MD,** and colleagues in the department of surgery-division of transplantation surgery at the University of Colorado Hospital, Aurora, PTA and ICT have demonstrated long-term stabilization of chronic kidney disease (CKD) in patients with type 2 diabetes. However, there are few data available on whether transplantation reduces future need for kidney transplantation and on mortality rates in that patient population.

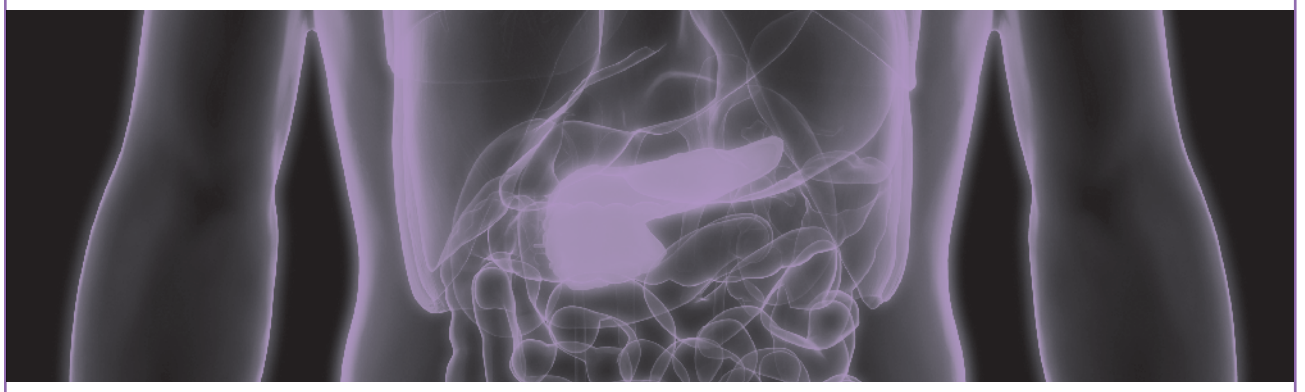
In a virtual poster presented at the 28th International Congress of the Transplantation Society, the researchers reported results of an analysis of patients with type 1 diabetes and CKD. The poster was titled *Pancreas Transplant in Chronic Kidney Disease for Type 1 Diabetic Patients*.

The researchers created a decision analytic Markov state transition model to simulate the life of patients with type 1 diabetes and CKD who underwent one of three interventions: (1) PTA alone; (2) ICT; or (3) medical management. For each intervention, in simulated cohorts of 3000 patients, estimated declines in eGFR, the chance of requiring a kidney transplant, and mortality were estimated. Base case patients were defined as type 1 diabetic patients 30 years of age with an initial eGFR of 30 mL/min/1.73 m^2. Sensitivity analysis of initial eGFR was performed, and Markov model parameters were extracted from literature review.

Across a spectrum of initial eGFR from 15 mL/min/1.73 m^2 to 60 mL/min/1.73 m^2, PTA and ICT were associated with improved long-term survival. For base case patients, patients in the ICT intervention group required few transplants and gained 17.8 years of life compared with medically managed patients, and 3.8 years of life compared with patients in the PTA intervention group.

"ICT is associated with stabilization of eGFR, thereby reducing the need for future kidney transplantation and improving long-term survival," the researchers said.

Source: Choudhury R, Yoeli D, Moore HB, Yaffe H, Nydam TL, Kennealey P. Pancreas transplant in chronic kidney disease for type 1 diabetic patients. Abstract of a poster presented at the virtual 28th International Congress of the Transplantation Society (Abstract P-4.109), September 13-16, 2020.



Pretransplant Dialysis Modality and Long-Term Outcomes in Kidney Transplantation

For patients with end-stage kidney disease (ESKD), kidney transplantation is the optimal therapy. However, preemptive kidney transplantation is not always possible; patients with ESKD are treated with hemodialysis or peritoneal dialysis while on the transplant waiting list. Data from previous studies of the impact of predialysis modality on patient and graft survival following transplantation were conflicting and the studies lacked sufficient follow-up.

Jin Hyuk Paek, MD, and colleagues at the Keimyung University School of Medicine, Daegu, South Korea, conducted a cohort study designed to examine the relationship of pretransplant dialysis modality with long-term clinical outcomes. The study utilized propensity score matching. Results were reported during a virtual poster session at the 28th International Congress of Transplantation in a poster titled *Pretransplant Dialysis Modality and Long-Term Outcomes in Kidney Transplantation Recipients: A Propensity Score Matching Analysis*.

The study cohort included 590 patients who underwent kidney transplantation at the medical center from 2003 to 2016. Preemptive and second or third kidney transplantations were excluded, resulting in an analysis cohort of 470 transplant recipients. Following matching, there were 90 recipients in each of the dialysis modality groups.

Mean duration of follow-up was 92.1 months. The rates of delayed graft function and biopsy-proven acute rejection in the first year following transplantation were similar in the two groups. At year 3, the peritoneal dialysis group had lower creatinine level compared with the hemodialysis group ($P=.029$), The two groups were similar in rates of 10-year patient survival and 10-year death-censored graft survival. In Cox proportional hazard model analysis, pretransplant modality was not an independent risk factor for patient mortality, graft failure, or death-censored graft failure.

"Pretransplant dialysis modality of peritoneal dialysis or hemodialysis did not influence long-term patient and graft survival after kidney transplantation. Moreover, short-term complications were similar between the two groups," the researchers said.

Source: Paek JH, Kwon O, Kim Y, Park WY, et al. Pretransplant dialysis modality and long-term outcomes in kidney transplantation recipients: A propensity score matching analysis. Abstract of a poster presented at the virtual 28th International Congress of Transplantation (Abstract P-11.194), September 13-16, 2020.

Post-Transplant Anemia Associated with Graft Loss

Following kidney transplantation, anemia is a frequent complication associated with increased cardiovascular morbidities and risk of graft loss. **Eyner Lozano, MD,** and colleagues in Bogota, Colombia, conducted a retrospective observational multicenter case control study to examine the main risk factors associated with post-transplant anemia in kidney transplant recipients in Colombia.

Results of the study were reported during a poster session at the 28th International Congress of the Transplantation Society in a poster titled *Factors Associated with Post-Transplant Anemia in Colombian Population with Kidney Transplant between 2007-2015: A Case Control Study*.

The study cohort included 111 patients in Colombia with a first-time kidney transplant during the study period. Hemoglobin concentration prior to and following transplantation at day 7, month 1, month 6, year 1, and year 2 were measured. Multiple logistic regression was used to calculate the odds ratio for each variable.

At 6-months post-transplant, the prevalence of anemia in the study cohort was 22%; at 12 months, the prevalence was 14%. The incidence of graft loss was higher among patients with anemia at 6 and 12 months ($P<.05$).

There was no significant correlation between the use of immunosuppressive agents or renin-angiotensin-aldosterone system inhibitors and post-transplant anemia ($P<.05$). There was a strong correlation between time on hemodialysis and post-transplant anemia at month 6 ($P<.05$).

In conclusion, the authors said, "Post-transplant anemia showed a strong correlation with renal function. Additionally, hemodialysis time is a predictor factor for post-transplant anemia. We emphasize the importance of prompt transplantation and a rigorous surveillance of hemoglobin concentration, and administration of erythropoietin stimulating agents if necessary. No significant statistical correlation was found between the use of immunosuppressants or renin-angiotensin-aldosterone system inhibitors and post-transplant anemia."

Source: Lozano E, Jaramillo D, Gallego J, Perez S, Isa A, Iza SN. Factors associated with post-transplant anemia in Colombian population with kidney transplant between 2007-2015: A case control study. Abstract of a poster presented at the virtual 28th International Congress of the Transplantation Society (Abstract P-11.185), September 13-16, 2020.

Care Coordination Program for Patients with Kidney Disease

In a recent press release, Blue Shield of California and Cricket Health announced a personalized and comprehensive care coordination program for members with late-stage chronic kidney disease (CKD) or end-stage renal disease (ESRD). There will be no additional cost to members who utilize the program.

According to the press release, Cricket Health will offer a multidisciplinary care team that will include nurses, pharmacists, social workers, dieticians, and trained patient mentors to help patients manage their CKD and ESRD. The approach will be evidence based and will be part of a long-term collaboration between Cricket Health and Blue Shield of California.

The management team will be available online and by telephone and will work closely with the member's medical care providers, including primary care physicians, nephrologists, and other specialists to work to maintain the patient's health and avoid hospitalizations. Members enrolled in Blue Shield's fully insured Preferred Provider Organization benefit plans are eligible for the program.

Seth Glickman, MD, chief health officer, Blue Shield of California, said, "We recognize that for too long, the healthcare system in the US has fallen short of providing patients who suffer from kidney disease—an estimated 37 million Americans—with the highest quality healthcare at an affordable cost. By working with Cricket Health, we can reimagine kidney care and expand healthcare options for members with late-stage CKD and ESRD so they can live the healthiest lives possible."

The program will enable personalized kidney care for each patient with the goal of slowing progression of the disease. For those patients whose kidney disease does progress, Cricket Health will help them explore treatment options and tools to help make their preferred treatment choice.

"This collaboration will fundamentally change what a kidney disease diagnosis means for patients, putting them in control of their kidney-care journey," **Arvind Rajan,** CEO, Cricket Health said. "Our comprehensive approach to CKD and ESRD care focuses on preventive care, slowing progression of the disease, and when needed, getting the treatment that's right for them. Together with Blue Shield, we will support their members with a multidisciplinary care team that reaches patients in the safety and comfort of their homes."

US FDA Grants Priority Review to PRX-102 to Treat Adults with Fabry Disease

The US FDA has granted an Acceptance of Biologics License Application (BLA) for the investigational therapy pegunigalsidase alfa (PRX-102) for the proposed treatment of adults with Fabry Disease. The agency has granted priority review status to PRX-102. The announcement came in a press release from Protalix Bio Therapeutics, Inc.

Protalix Bio Therapeutics is a biopharmaceutical company whose work focuses on the development, production, and commercialization of recombinant therapeutic proteins produced by its proprietary ProCellEx® plant cell-based protein expression system. The company made the announcement with its development and commercialization partner Chiesi Global Rare Diseases, a unit of the international research-focused healthcare group, Chiesi.

PRX-102 is the company's long-acting recombinant, PEGylated, cross-linked a-galactosidase-A investigational product candidate. The FDA set an action date of January 27, 2021, under the Prescription Drug User Fee Act. In the communication letter from the FDA, the agency indicated that it is not currently planning on holding an advisory committee meeting to discuss the application.

Following the acceptance of the BLA, the Priority Review shortens the FDA review period from 10 months to 6 months. In January 2018, the FDA granted Fast Track designation to PRX-102.

Dror Bashan, president and CEO, Protalix, said, "The FDA's acceptance of the BLA and grant of Priority Review status for PRX-102 are significant achievements for Protalix and Chiesi, and represent a crucial step forward as we look to establish a new treatment option to the Fabry patient community. Based on the encouraging results for PRX-102 we have seen to date, we are eager to continue discussion with the FDA and to continue our other development efforts for PRX-102, as marketing approval of PRX-102 is our top priority."

Giacomo Chiesi, head of Chiesi Global Rare Diseases, said, "PRX-102 represents an important advance in research with the potential to deliver significant advantages to patients with Fabry disease. We are very encouraged by the strong interest in this therapy among patients and clinicians and we look forward to the prospect of making it available to patients around the world who can benefit from treatment."

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MAJOR MEETINGS 2021

Annual Dialysis Conference
March 5-7, 2021
Virtual
https://annualdialysisconference.org

National Kidney Foundation Spring Clinical Meetings 2021
April 6-10, 2021 ***(virtual and in-person)***
Orlando, Florida
www.kidney.org/spring-clinical

Renal Physicians Association Annual Meeting 2021
March 18-21, 2021
New Orleans, Louisiana
www.renalmd.org/page/calAnnualMeeting

American Transplant Congress 2021
June 5-9, 2021
Seattle, Washington
http://atcmeeting.org

American Nephrology Nurses Association 2021 National Symposium
May 2-5, 2021
Palm Springs, California
www.annanurse.org/events/2021-national-symposium

American Society of Nephrology Kidney Week 2021
November 2-7, 2021
San Diego, California
www.asn-online.org/education/kidneyweek/archives/future.aspx

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Fresenius Foundation and UNOS Transportation Improvement Program

The Fresenius Medical Care Foundation has announced a grant of $106,0000 to the United Network for Organ Sharing (UNOS). The grant will support UNOS, a nonprofit organization that manages the nation's organ transplant system, by helping to improve transportation and logistics for organ donation. The Fresenius Medical Care Foundation is a separately operated 501(c)(3) nonprofit arm of Fresenius Medical Care North American.

The grant will support initiatives designed to better predict organ travel time and improve tracking using biosensor technology to ensure that fewer kidneys are discarded due to time outside the body. Initiatives that will be supported by the grant include predicting organ travel time, understanding cold ischemic time, and organ tracking. At present, there is no single national transportation system that can provide streamlined service moving donated organs to transplant hospitals. Each organ procurement organization and transplant center is responsible for obtaining its own transport solutions, creating a need for a centralized method to identify best practices and process efficiencies. The UNOS organ tracking pilot kicked off in late spring.

In a press release from the foundation, **Bill Valle,** chief executive officer of Fresenius Medical Care North America and president of the foundation, said, "We are excited to support UNOS's efforts to streamline logistics and enable more individuals to receive an organ donation. The best option to give life back to a patient with kidney failure is through transplant, and these important initiatives will hopefully create more opportunities to successfully do so."

NKF/ASN Joint Task Force on Use of Race in eGFR

In a late summer press release, the National Kidney Foundation (NKF) and the American Society of Nephrology (ASN) announced the formation of a joint task force that will focus on the use of race to estimate glomerular filtration rate (GFR). According to the release, "The use of race in the estimation of GFR is a vital concern to kidney health professionals, patients, and others who work in healthcare. NKF and ASN are committed to ensuring that clinicians provide the best, most equitable care for each patient."

"This joint task force will incorporate concerns of the patients, the public, and kidney professionals as it examines the scientific and ethical issues relative to use of race in eGFR," **Holly Mattix-Kramer, MD, MPH,** president of NKF said.

Anupam Agarwal, MD, FASN, president of ASN, added, "Together, NKF and ASN are committed to ensuring that eGFR provides an unbiased assessment of kidney function."

The task force is expected to issue its initial recommendations late this year. NKF and ASN plan to establish an eGFR Advisory Board to review and comment on the draft recommendations prior to finalization.

Renalytix AI Files for US FDA Clearance of KidneyIntelX™

Renalytix AI plc has announced that it has filed a submission with the US FDA seeking clearance of KidneyIntelX™. The filing builds on the company's regulatory and commercialization program that includes the announcement earlier this year that the New York state department of health issued a clinical laboratory permit for commercial clinical testing of KidneyIntelX.

KidneyIntelX is designed to provide critical new information to healthcare providers, insurance payers, and population health managers to support optimization of care delivery, improvement in patient outcomes, and reduction in the $120 billion cost of chronic and end-stage kidney disease to the US healthcare system. In 2019, the FDA granted Breakthrough Device designation to KidneyIntelX. FDA clearance is now being sought for the intended use of KidneyIntelX, in conjunction with clinical evaluation, as an aid to further assess the risk of progressive decline in kidney function in adult patients with chronic kidney disease (CKD) and type 2 diabetes.

According to a press release from Renalytix AI, performance data provided by Renalytix AI in the FDA 510(k) submission is based on a multicenter validation study of more than 1100 patients demonstrating that KidneyIntelX accurately identifies patients in early CKD stages 1, 2, and 3 who are at highest risk of progressive decline in kidney function and/or kidney failure. ■

CONFERENCE COVERAGE AMERICAN TRANSPLANT CONGRESS

Disparities in Access to HCV Positive-Donor/HCV Negative-Recipient Transplant

Following successful pilot trials of transplanting organs from hepatitis C virus (HCV) viremic donors into HCV-negative recipients, there has been an expansion of the practice. Direct-acting antiviral (DAA) therapies are costly, creating barriers to insurance coverage approvals, particularly in transplantation from HCV positive donors to HCV-negative recipients, due in part to off-label treatment of acute HCV following intentional HCV transmission.

There are few data available on whether there are socio-demographic disparities with respect to access to HCV positive donor organs among HCV-negative patients. **T. Nguyen** and colleagues conducted an analysis using data from the Organ Procurement and Transplantation Network and the United Network for Organ Sharing from January 1, 2017, to June 30, 2019. Results were reported during the virtual American Transplant Congress 2020 in a presentation titled *Socio-Demographic Disparities in Access to Organs from HCV-Viremic Donors among HCV-Negative Patients.*

The analysis included kidney, liver, heart, and/or lung transplant recipients at centers that performed ten or more HCV positive donor/HCV negative recipient transplants of the organ type. States' Medicaid policies were categorized as grades A to F, according to ratings from the Center for Health Law and Policy Innovation of Harvard Law School and the National Viral Hepatitis Roundtable. Under-represented minorities were defined as Hispanic and Black patients.

Evaluation of factors associated with receiving an HCV donor-negative/HCV recipient-positive transplant utilized multivariable mixed effects logistic regression models (center as random effect). Marginal standardization was used to predict the standardized proportion of HCV donor-positive/HCV recipient-negative transplants within insurance and state subgroups standardized with respect to the distribution of all other covariates.

During the study period, 29 transplant centers performed 10 or more HCV donor-positive/HCV donor-negative transplants of one organ type. In multivariable mixed effects models, women (odds ratio [OR], 0.70; 95% confidence interval [CI], 0.61-0.80; $P<.001$) and under-represented minorities (OR, 0.80; 95% CI, 0.69-0.92; $P=.003$) were significantly less likely to receive an HCV donor-positive/HCV recipient-negative transplant. Patients with an education level of grade school or less were also significantly less likely to receive an HCV donor-positive/HCV recipient-negative transplant (OR, 0.55; 95% CI, 0.39-0.79; $P=.001$), compared with college-educated transplant recipients.

There was significant interaction with Medicaid insurance and state HCV Medicaid grade ($P=.01$): Medicaid insurance was only associated with a lower probability of receiving an HCV donor-positive/HCV donor-negative transplant in HCV Medicaid-restricted states.

In conclusion, the researchers said, "Women, under-represented minorities, patients with the least educational attainment, and Medicaid-insured patients living in HCV Medicaid-restricted states have less access to transplantation from HCV-viremic donors. Understanding the individual factors and public policies that contribute to the disparities in the transplant waitlist can aid in optimizing fair distribution of these limited resources."

Source: Nguyen T, William W, Sise M, Reese P, Goldberg D. Socio-demographic disparities in access to organs from HCV-viremic donors among HCV-negative patients. Abstract of a presentation at the virtual American Transplant Congress 2020 (Abstract 485), May 30, 2020.

ACUTE KIDNEY INJURY

Mortality Risk after Kidney Failure Due to AKI

Clinical Journal of the American Society of Nephrology. 2020;15(7):995-1006

Outcomes among patients with acute kidney injury (AKI) requiring dialysis add to the increasing burden of kidney failure. However, there are few data on the frequency and patterns of recovery of AKI and the effects of AKI on outcomes in patients on incident dialysis. Researchers, led by **Silvi Shah, MD, MS, FASN,** at the Division of Nephrology Kidney CARE Program, University of Cincinnati, Ohio, conducted a retrospective study to examine the association of kidney failure due to AKI with the outcome of all-cause mortality, as well as the associations of sex and race with kidney recovery.

The study utilized data from the US Renal Data System to identify a cohort of 1,045,540 patients on incident dialysis from January 1, 2005, to December 31, 2014. Mean age of the cohort was 63 years and 3% (n=32,598) of the patients on incident dialysis had kidney failure due to AKI.

Compared with kidney failure due to diabetes mellitus, kidney failure due to AKI was associated with a higher mortality in the first 0 to 3 months after initiation of dialysis (adjusted hazard ratio [aHR], 1.28; 95% confidence interval [CI], 1.24-1.32) and at 3 to 6 months (aHR, 1.16; 95% CI, 1.11-1.20).

Thirty-five percent of the patients with kidney failure related to AKI (n=11,498) eventually recovered kidney function, 95% of those within 12 months. Women were less likely to recover than men (aHR, 0.86; 95% CI, 0.83-0.90). Compared with whites, the likelihood of kidney recovery was lower among Blacks (aHR, 0.68; 95% CI, 0.64-0.72), Asians (aHR, 0.82; 95% CI, 0.69-0.96), Hispanics (aHR, 0.82; 95% CI, 0.76-0.89), and Native Americans (aHR, 0.72; 95% CI, 0.54-0.95).

"Kidney failure due to AKI confers a higher risk of mortality in the first 6 months compared with kidney failure due to diabetes or other causes. Recovery within 12 months is common, although less so among women than men and among Black, Asian, Hispanic, and Native American patients than white patients," the researchers said.

ADPKD

Classification of ADPKD Using Recalculated htTKV

Journal of the American Society of Nephrology. 2020;31(7):1640-1651

Autosomal dominant polycystic kidney disease (ADPKD) classification with Mayo Clinic imaging uses height-adjusted total kidney volume (htTKV) and age to identify patients at greatest risk for disease progression. According to **Kyongtae T. Bae, PhD, MD, MBA,** and colleagues, that classification applies only to patients with typical diffuse cystic disease (class 1). For the 5% to 10% of patients with atypical morphology (class 2), htTKV is a poor predictor of decline in estimated glomerular filtration rate (eGFR), making imaging-based risk model-

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ing unresolved in that patient population.

Among patients in the HALT-A (Halt Progression of Polycystic Kidney Disease A) study with ADPKD (n=558), 25 patients of class 2A with prominent exophytic cysts (class 2Ae) and 43 patients of class 1 with prominent exophytic cysts were identified. The researchers recalculated the htTKVs to exclude exophytic cysts. They compared predictions for developing chronic kidney disease stage 3 and for eGFR trajectory using the original and recalculated htTKVs in association with imaging classification in logistic and mixed linear models.

Following adjustment for baseline age, sex, eGFR, body mass index, and race, using recalculated htTKVs increased specificity for developing chronic kidney disease (CKD) stage 3 in all participants from 82.6% to 84.2%. Using a cutoff of 0.5 for predicting case status, the predicted proportion of class 2Ae patients developing CKD stage 3 was better calibrated to the observed value of 13.0% with recalculated htTKVs versus original htTKVs (45.5% vs 63.6%, respectively).

The mean paired difference between predicted and observed eGFR was reduced using recalculated htTKVs from 17.6 using original htTKVs to 4.0 mL/min/1.73 m^2 for class 2Ae, and from –1.7 (using original htTKVs) to 0.1 mL/min/1.73 m^2 for class 1.

In conclusion, the researchers said, "Use of a recalculated htTKV measure that excludes prominent exophytic cysts facilitates inclusion of class 2 patients and reclassification of class 1 patients in the Mayo classification model."

Tolvaptan Improved Urinary Lithogenic Risk Profile

Clinical Journal of the American Society of Nephrology. 2020;15(7):1007-1014

Nephrolithiasis is a common complication associated with autosomal dominant polycystic kidney disease (ADPKD) and a significant risk for patient morbidity. It is unknown whether tolvaptan, recently approved for the treatment of patients with ADPKD, is associated with alterations of the urinary lithogenic risk profile.

Matteo Bargagli, MD, and colleagues in Italy recently conducted an analysis of participants of the prospective observational cohort study, the Bern ADPKD Registry. The study protocol included 24-hour urine analyses at baseline and again at yearly follow-ups. EQUIL2 was used to calculate relative supersaturation ratios for calcium oxalate, brushite, and uric acid. The association of tolvaptan with the urinary parameters relevant to formation of kidney stones was assessed in unadjusted and multivariable mixed-effects linear regression models. Variables were age, sex, body mass index, estimated glomerular filtration rate, net acid excretion, and height-adjusted total kidney volume. Maximum individual follow-up was 3 years, median follow-up time was 1.9 years, and cumulative follow-up time was 169 years.

A total of 125 study participants were included in the current analysis (38 with and 87 without tolvaptan treatment). In the adjusted estimate

of the difference between tolvaptan and no tolvaptan, there were associations between tolvaptan and lower urine relative supersaturation ratios for calcium oxalate (–0.56; 95% confidence interval [CI], –0.82 to –0.3; *P*<.001), brushite (–0.33; 95% CI, –0.54 to –0.11; *P*=.004), and uric acid (–0.62; 95% CI, –0.88 to –0.37; *P*<.001), and with higher urine citrate in mmol/mmol creatinine per day excretion (0.25; 95% CI, 0.05-0.46; *P*=.02) and calcium in mmol/mmol creatinine per day excretion (0.31; 95% CI, 0.09-0.53; *P*=.006). Tolvaptan was also associated with lower net acid excretion in mEq/mmol creatinine per day (–0.54; 95% CI, –0.90 to –0.17; *P*=.004) and higher net gastrointestinal alkali absorption in mEq/mmol creatinine per day (0.57; 95% CI, 0.26-0.88; *P*<.001).

"Tolvaptan treatment is associated with a significantly improved urinary lithogenic risk profile in patients with ADPKD," the researchers said.

CHRONIC KIDNEY DISEASE

Mitochondrial Dysfunction Prior to Dialysis Initiation

Clinical Journal of the American Society of Nephrology. 2020;15(7):926-936

Frailty and sarcopenia are common comorbidities among patients with chronic kidney disease (CKD) and are associated with higher morbidity and mortality in that patient population. Skeletal muscle mitochondria are key in physical function and, according to **Jorge L. Gamboa, MD, PhD,** and colleagues, may be a target to prevent frailty and sarcopenia. The researchers conducted a study to test the hypothesis that there is an association between mitochondrial dysfunction and CKD severity. The study was also designed to examine the interaction between mitochondrial function and coexisting comorbidities such as impaired physical performance, intermuscular adipose tissue infiltration, inflammation, and oxidative stress.

The study cohort included 63 individuals, including 21 controls, 20 patients with CKD not on maintenance hemodialysis, and 22 patients on maintenance hemodialysis. The researchers evaluated in vivo knee extensors mitochondrial function using P magnetic resonance spectroscopy to determine the phosphocreatine recovery time contrast, a measure of mitochondrial function. They also measured physical performance using the 6-minute walk test, intermuscular adipose tissue infiltration with magnetic resonance imaging, as well as markers of inflammation and oxidative stress in plasma in skeletal muscle biopsies from a select number of patients in the maintenance hemodialysis group. Markers of mitochondrial dynamics (fusion and

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COVID-19

Abnormalities in Renal Function after COVID-19

Journal of the American Society of Nephrology. doi.org/10.1681/ASN.2020040432

According to **Evan A. Farkash, MD, PhD,** and colleagues, a significant fraction of patients with coronavirus disease 2019 (COVID-19) display abnormalities in renal function, a marker of poor prognosis. Results of retrospective studies of patients hospitalized with COVID-19 in Wuhan, China, report an incidence of 3% to 7% progression to renal function abnormalities. The cause of renal failure in this patient population is unknown; researchers have hypothesized that the mechanism is direct renal infection by the causative virus, SARS-CoV-2.

Dr. Farkash et al. conducted an autopsy on a patient who died of COVID-19 following open repair of an aortic dissection, complicated by hypoxic respiratory failure and oliguric renal failure. Light and electron microscopy were used to examine renal tissue for evidence of SARS-CoV-2 within renal cells.

Geographic isometric vacuolization, corresponding to a focus of tubules with abundant intracellular viral arrays, were seen in light microscopy of proximal tubules. Individual viruses were an average of 76 µm in diameter and had an envelope studded with crown-like, electron-dense spikes. Vacuoles contained double-membrane vesicles suggestive of partially assembled virus.

"The presence of viral particles in the renal tubular epithelium that were morphologically identical to SARS-CoV-2, and with viral arrays and other features of virus assembly, provide evidence of a productive direct infection of the kidney by SARS-CoV-2. This finding offers confirmatory evidence that direct renal infection occurs in the setting of acute kidney injury in COVID-19. However, the frequency and clinical significance of direct infection with COVID-19 is unclear. Tubular isometric vacuolization observed with light microscopy, which correlates with double-membrane vesicles containing vacuoles observed with electronic microscopy, may be a useful histologic marker for active SARS-CoV-2 infection in kidney biopsy or autopsy specimens," the researchers said.

Early Adoption of COVID-19 Control Measures at a Large Urban Dialysis Center

Journal of the American Society of Nephrology. doi.org/10.1681/ASN.2020040534

During the coronavirus disease 2019 (COVID-19) epidemic, requirements for social distancing were instituted in many countries, including England. Patients with end-stage renal disease requiring dialysis in settings not typically conducive to social distancing are at increased risk for COVID-19. **Richard W. Corbett, Bm BCh,** and colleagues at the West London Renal and Transplant Centre described control measures implemented at the center during the COVID-19 epidemic.

The center recorded new COVID-19 infections and outcomes for all adult patients receiving dialysis over a 6-week period. The control methods introduced included a two-stage routine screening process at dialysis entry (temperature and symptom check, with possible cases segregated within the unit and tested for SARS-CoV-2), isolated dialysis in a separate unit for patients with infections, and universal precautions such as masks for dialysis nursing staff.

Of the 1530 patients (median age 66 years; 58.2% men) treated with dialysis at the center during the 6-week period, 19% (n=300) developed COVID-19 infection; resulting in a large demand for isolated outpatient and inpatient beds. In an analysis that included 1219 patients attending satellite dialysis clinics, older age was a risk factor for infection. Compared with patients dialyzing at home, patients receiving in-center dialysis were substantially more likely to develop COVID-19 infection. There were clusters of infection in specific units and on specific shifts, with possible implications for aspects of service design; there were also high rates of nursing staff illness.

A reproduction number of 2.2 was estimated from a predictive epidemic model. There was a favorable deviation in cumulative cases from the model from the fourth week, suggesting that transmission was controlled with the implemented measures.

In summary, the researchers said, "The COVID-19 epidemic affected a large proportion of patients at this dialysis center, creating service pressures exacerbated by nursing staff illness. Details of the control strategy and characteristics of this epidemic may be useful for dialysis providers and other institutions providing patient care."

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fission) were also measured.

In the maintenance dialysis group, there was a prolonged phosphocreatine recovery constant (median, 53.3 seconds); in the group not on hemodialysis, the median phosphocreatine recovery was 41.5 seconds. In the control group, the median recovery was 38.9 seconds (*P*=.001 among groups). There was an association between mitochondrial dysfunction and poor physical performance (r=0.62; *P*=.001), greater intermuscular adipose tissue (r=0.44; *P*=.001), and increased markers of inflammation and oxidative stress (r=0.60; *P*=.001).

Finally, the analysis demonstrated mitochondrial fragmentation and increased content of dynamin-related protein 1, a marker of mitochondrial fission, in skeletal muscles from patients in the maintenance hemodialysis group compared with controls (median, 0.86 arbitrary units vs 0.60 arbitrary units, respectively).

In conclusion, the researchers said, "Mitochondrial dysfunction is due to multifactorial etiologies and presents prior to the initiation of maintenance hemodialysis, including in patients with CKD stages 3-5."

Healthcare Costs in Patients with CKD with and without Comorbidities

Journal of the American Society of Nephrology. 2020;31(7):1594-1601

Patients with chronic kidney disease (CKD) incur higher healthcare costs that increase with disease progression. There are few data available on the type of healthcare costs associated with CKD across all stages in a general population with a substantial comorbidity burden. **Gregory A. Nichols, PhD,** and colleagues conducted a study to examine healthcare costs by expenditure type and, in patients with CKD, by estimated glomerular filtration rate (eGFR) and presence of comorbidities.

Using electronic medical records of an integrated delivery system, the researchers categorized 146,132 patients with eGFR data in 2016 or 2017 and examined nonmutually exclusive groups based on the presence of diabetes mellitus, cardiovascular disease, or heart failure. One-year follow-up data were used to calculate outpatient, inpatient, emergency, pharmaceutical, dialysis, and total healthcare costs by eGFR (eGFR categories as defined by Kidney Disease Improving Global Outcomes criteria), adjusted for age, sex, and nonwhite race.

Among patients with CKD without comorbidities, mean total healthcare costs were 31% higher compared with patients without CKD ($7374 vs $5631, respectively). Among those with CKD and no comorbidities, hospitalizations accounted for 35% of the total healthcare costs; among patients with CKD and heart failure, hospitalizations accounted for up to 55% of total costs. The proportion of costs related to hospitalizations increased with declining kidney function, reaching as high as 66%.

In conclusion, the researchers said, "Poorer kidney function and the presence of diabetes mellitus, cardiovascular disease, or heart failure drive substantial healthcare costs and increase the proportion of costs attributable to inpatient care. The large contribution of inpatient costs begins in earlier stages of CKD and escalates as kidney function declines. Additional therapies to reduce CKD incidence, slow CKD progression, and lower hospitalization risk are needed to benefit patients and reduce CKD's economic burden."

HEMODIALYSIS

Predictors of Arteriovenous Fistula Maturation

Journal of the American Society of Nephrology. 2020;31(7):1617-1627

Patients initiating dialysis and selected for surgical arteriovenous fistula (AVF) creation routinely undergo ultrasound mapping to select vessels that meet minimal threshold diameters. However, according to **Crystal A. Farrington, DO,** and colleagues, presurgical ultrasound mapping does not improve rates of AVF maturation, suggesting a need to reassess the preoperative ultrasound criteria used currently to optimize AVF maturation.

The researchers conducted a retrospective study to examine the association of preoperative vascular measurement and hemodynamic factors with unassisted AVF maturation and with overall AVF maturation. Unassisted AVF maturation was defined as successful use for dialysis without prior intervention, and overall AVF maturation was defined as successful use with or without prior intervention. Preoperative factors associated with the outcomes of interest were identified using multivariable logistic regression. The study cohort included 300 catheter-dependent patients on hemodialysis with a new AVF created between 2010 and 2016.

There were associations between unassisted AVF maturation and preoperative arterial diameter (adjusted odds ratio [aOR], 1.50 per 1-mm increase; 95% confidence interval [CI], 1.23-1.83), preoperative systolic blood pressure (aOR, 1.16 per 10-mm Hg increase; 95% CI, 1.05-1.28), and left ventricular ejection fraction (aOR, 1.07 per 5% increase; 95% CI, 1.01-1.13). There were associations between overall AVF maturation and preoperative arterial diameter (aOR, 1.36 per 1-mm increase; 95% CI, 1.10-1.66) and preoperative systolic blood pressure (aOR, 1.17; 95% CI, 1.06-1.30).

Using receiver operating curves, the combination of preoperative arterial diameter, systolic blood pressure, and left ventricular ejection fraction was fairly predictive of unassisted maturation (area under the curve, 0.69). There were no associations between maturation and patient age, sex, race, diabetes, vascular disease, obesity, and AVF location.

In conclusion, the researchers said, "Preoperative arterial diameter may be an under-recognized predictor of AVF maturation. Further study evaluating the effect of preoperative arterial diameter and other hemodynamic factors on AVF maturation is needed."

TRANSPLANTATION

Recipient and Graft Survival among Extremely Aged Transplant Recipients

Nephrology Dialysis Transplantation. 2020;35(4):687-696

With advances in life expectancy has come an increase in the number of elderly individuals with end-stage renal disease (ESRD). There are few data available on the outcomes of kidney transplantation in extremely elderly patients based on an allocation policy that prioritizes donor-recipient age matching. **Jimena Cabrera, MD,** and colleagues conducted an analysis of 138 kidney transplant recipients ≥75 years of age who underwent transplantation from similarly aged deceased donors between 2002 and 2015. Cox regression was used to assess determinants of death-censored graft and patient survival.

The analysis included 138 patients. Median follow-up was 38.8 months, median age of recipients and donors was 77.5 and 77.0 years, respectively; 22.5% of donors were >80 years of age. Primary graft nonfunction occurred in 8.0% (n=11/138) of the cohort.

The cumulative incidence rates for post-transplant infection and biopsy-proven acute rejection (BPAR) were 70.3% (n=97/138) and 15.2% (n=21/138), respectively. One-year patient survival was 82.1%; 5-year patient survival was 60.1%. The rates for death-censored graft survival were 95.6% at 1 year and 93.1% at 5 years.

The leading cause of death was infection (46.0% of fatal cases). There was an association between BPAR and lower 1-year patient survival (hazard ratio [HR], 4.21; 95% confidence interval [CI], 1.64-10.82; *P*=.003). The only factor that predicted 5-year death-censored graft survival was diabetic nephropathy (HR, 4.82; 95% CI, 1.08-21.56; *P*=.040).

"ESRD patients ≥75 years can access kidney transplantation and remain dialysis free for their remaining lifespan by using grafts from extremely aged deceased donors, yielding encouraging results in terms of recipient and graft survival," the researchers said. ■

Sarah Tolson

Estimating Reimbursement per Treatment

Recently, the director of a free-standing, in-center hemodialysis program reached out to me in an effort to gain insight into what their reimbursement may look like if they were to add peritoneal dialysis services to their in-center program. During my time at Sceptre Management Solutions, I have had the pleasure of working with many new dialysis programs to assist program owners in growing their programs. In this edition of From the Field, we will review several factors that may play a key role in a dialysis program's reimbursement per treatment.

One of the largest factors in a dialysis program's reimbursement per treatment is their payer mix, or the ratio of commercial to government-based insurance coverage. Generally, dialysis programs that have more patients with commercial insurance coverage compared with patients with coverage through programs like Medicare, Medicaid, and the VA have a higher reimbursement per treatment. Commercial insurance plans often reimburse at a higher rate than government-based plans.

Several years ago, I worked with a small dialysis program that had around 25 patients. Most patients were covered by Medicare and Medicaid, three to four had commercial coverage, and one to two had only Medicaid or no insurance at all. This program's cost per treatment was about the same as the reimbursement per treatment they received from the Medicare/Medicaid patients. The reimbursement per treatment on the commercial patients was significantly more than the cost per treatment and the additional revenue was used to subsidize the costs treating patients with Medicaid or no insurance coverage. Extra funds were pooled for making improvements or repairs to the dialysis facility.

One reason payer mix is such a large factor in a dialysis program's reimbursement per treatment is that commercial payers generally reimburse at a higher rate than government-based insurance plans. Contracts, single case agreements, and out of network benefits determine how much an insurance company will reimburse for dialysis services. Each insurance company may offer many different insurance plans to their members and there can be different levels of reimbursement dependent on the plan. It is critical for a dialysis program to understand the reimbursement and requirements for reimbursement associated with each of their patient's insurance policies. Some insurance companies require authorization in order to obtain reimbursement, others reimburse at a percentage of billed charges for out of network providers so long as the patient receiving treatment has out of network benefits, and others reimburse the equivalent of Medicare rates to non-contracted providers and a per-diem rate to contracted providers.

Most dialysis programs have a fair portion of patients whose primary insurer is Medicare. As such, it's important to have an idea of how much Medicare will reimburse per treatment. There are several factors that influence Medicare's reimbursement for dialysis: facility location, patient age, height, weight, length of time on dialysis, as well as several other factors. CMS does publish a free claims price estimator on their website that can be used to determine the rate Medicare would reimburse for a particular patient.

One of the largest factors in a dialysis program's reimbursement per treatment is their payer mix.

As we know, Medicare reimburses 80% of the allowed reimbursement for dialysis treatments. In a dialysis program comprised predominantly of Medicare primary patients, it is critical to a facility's bottom line that all patients have secondary coverage that will reimburse all or most of the Medicare assigned deductibles and coinsurances. At Sceptre Management Solutions, we work with dialysis programs across the country and Medicaid programs in many states. There are quite a few states in which Medicaid, when secondary to Medicare, will not reimburse or only reimburse very little of the Medicare assigned coinsurance and the dialysis program is required to write off the uncollected balance. This is a great protection to the dialysis patients whose medical bills may be substantially more than their income—but if a dialysis program is not aware that Medicaid will not reimburse the Medicare coinsurance, there could be devastating effects on a program's bottom line. ■

Sarah Tolson is the director of operations for Sceptre Management Solutions, Inc., a company specializing in billing for outpatient ESRD facilities, nephrology practices, and vascular access. Your questions are welcome and she can be reached at stolson@sceptremanagement.com, 801.775.8010, or via Sceptre's website, www.sceptremanagement.com.

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