

CHRONIC KIDNEY DISEASE FROM COMORBIDITY TO DIALYSIS: NEPHROLOGY ACROSS THE SYSTEM OF CARE

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How can health systems provide care for chronic kidney disease (CKD) patients across the care continuum? What role do health systems play in treating chronic kidney disease?

Overview

Caring for patients with chronic kidney disease provides a challenge for health systems. These patients are medically complex with multiple comorbidities and are at significant risk for progression into kidney failure, known as end-stage renal disease (ESRD). Patients with ESRD must start dialysis or receive a kidney transplant in order to survive.

Historically, management of this chronic disease has been fragmented across different sites of care and providers. Health systems play a crucial role in the care of CKD patients throughout the patient journey, especially when managing the health of a population. Even in a fee-for-service environment, comprehensive care will yield both cost savings and the potential for increased ambulatory revenue as chronic patients are more systematically guided to evidence-based screenings, services and interventions within the System of CARE.

Chronic Kidney Disease Called a “Silent Killer”

While CKD is among the top 10 causes of death in the US, it receives relatively little attention. One-third of American adults are at risk for developing some type of kidney disease, and according to the 2018 United States Renal Data System Annual Data Report, approximately 14% of American adults have CKD. Chronic kidney disease occurs when kidneys become damaged and can no longer filter blood effectively. Due to the excess fluid and waste remaining in the bloodstream, CKD can lead to other significant health issues. Accordingly, CKD has been called the silent killer because symptoms can go undetected until the disease is in advanced stages.

Multiple medical conditions can cause CKD, though type 2 diabetes and hypertension are most common. Other causes include genetic syndromes, congenital defects, inflammation, infection and adverse drug events. Common risk factors associated with higher rates of kidney disease include cardiovascular disease, smoking, obesity and family history. African American, Native American and Asian American populations are also at a disproportionately high risk of developing CKD.

CKD falls on a continuum of stages, as shown in **Table I**. ESRD represents the fifth and final stage of CKD, but patients with CKD are 16 to 40 times more likely to die than reach this final stage.

The best hope for treatment lies in earlier detection and lifestyle interventions during CKD stages 1 through 3. There is significant room for improvement in reducing the number of patients who progress to later stages of CKD and to ESRD.



TABLE I. THE CHRONIC KIDNEY DISEASE CONTINUUM

CKD STAGE	GFR	ACR	DESCRIPTION	PRESENTATION
Healthy	>90	<30		
At Risk	>90	<30	+ Diabetes, hypertension, obesity, older age or family history	Normal
Stage 1	>90	>30	Damage but normal function	
Stage 2	60–89		Mild loss of function	Asymptomatic
Stage 3	30–59		Mild to severe loss of function	
Stage 4	15–29		Severe loss of function	Overt symptoms
Stage 5	<15		Failure, ESRD	Dialysis or death

ACR = albumin to creatine ratio, measured in mg/g; GFR = glomerular filtration rate, measured in ml/min/1.73m².

Sources: Kidney Disease Improving Global Outcomes (KDIGO). KDIGO 2012 clinical practice guideline for the evaluation and management of chronic kidney disease. *Kidney Int Suppl.* 2013;3(1); Sg2 Analysis, 2019.

The Costly Progression to ESRD

Unmanaged Disease Leads to Hospitalization

Difficulty managing ESRD and multiple comorbidities often results in frequent hospital visits and poor clinical outcomes, underscoring the need for early intervention. Sg2’s 2019 Impact of Change[®] forecast expects inpatient discharges to grow by 21% and ESRD outpatient volumes to grow by 21%.

When CKD is left unmanaged, patients can “crash” into kidney failure. This occurs when a patient is unaware that he or she has CKD, or has not been treated by a nephrologist, and subsequently presents in the emergency department with kidney failure (ESRD). On average, patients with ESRD visit the emergency department 3 times per year and are hospitalized 1.7 times per year. Hospitalizations average 11.2 days, and 30-day readmission rates for ESRD are a staggering 35.4%.

As costs of care rise and the disease burden grows, health systems will be pressed to effectively treat this patient population across the System of CARE.

ESRD Drives up Medicare Spending

Patients with ESRD have only 2 options to survive: to go on dialysis or undergo a kidney transplant. Transplants provide the best chance for long-term survival and optimal patient outcomes, but the limited supply of kidneys has directed the majority of ESRD patients to dialysis.

Regardless of age, patients with ESRD are eligible for Medicare benefits. In 2016, ESRD patients accounted for only 1% of the Medicare population but 7% of Medicare spending. Total Medicare expenditures for ESRD in 2016 were \$35 billion. The bulk of this spending was attributed to hospitalizations and dialysis. In response, CMS is paying closer attention than ever to the costs of kidney care.



Integrating Services Across the System of CARE

Optimizing care for CKD patients requires a sound strategy focused on care integration. Integration efforts have historically been led by dialysis providers. However, emerging federal policies combined with interest from providers, patients, payers and health technology start-ups have spurred efforts to integrate care and provide new types of treatment aimed at early detection. The current climate presents an opportunity for health systems to integrate kidney care, both in value-based care and fee-for-service environments.

Value-Based Care: Adopting a Population Health Management Approach

Historically, value-based care for ESRD has centered around the dialysis clinic as the key stakeholder. The Comprehensive ESRD Care (CEC) Model, which began in 2015 and will run through December 2020, has sought to test the effectiveness of a new advanced alternative payment model in which large dialysis centers enter into contracts with both upside and downside risk, whereas smaller dialysis centers receive shared shavings through upside risk only. Currently, 33 ESRD Seamless Care Organizations (ESCOs) participate in the CEC Model. This model encourages dialysis providers to expand their traditional roles in care delivery to address beneficiaries' needs both in and out of the dialysis clinic. While the cost savings of this model have yet to be determined, studies have shown that the opportunities for cost savings increase as shared risk increases.

Despite implementation of the ESCO model, gaps in care still exist, due to limited participation in the model, poorly aligned incentives within and between dialysis clinics and other providers, and the difficulty of care coordination. These gaps span 3 areas:

1. Prevention, diagnosis and monitoring of CKD
2. Treatment of ESRD
3. Transition to transplant

Health systems participating in population health initiatives will find a compelling value proposition in assuming a more active role in managing the care and costs of their CKD/ESRD patient population.

Hospitals can develop an integrated kidney care program on their own, leveraging work in other service lines and for other chronic conditions, including using care coordination and patient education for diabetes, for CKD care. For organizations unable to develop an integrated program internally, partnership with a start-up is an alternative option.

Risk-Based Partnership With a Kidney Care Start-up

In recent years, several kidney care start-ups have emerged that offer options to share risk on the cost and outcomes of CKD/ESRD patients. Health systems have begun partnering with these companies to alleviate the burden on the staff, technology, infrastructure and expertise required to integrate care for these patients.

CASE EXAMPLE

Building a Kidney Care Program at Intermountain Healthcare Kidney Services Program

Utah's Intermountain Healthcare Kidney Services Program provides treatment for all stages of CKD, including ESRD, in addition to other types of kidney disease. Its kidney clinic, which opened in September 2019, aims to provide fully integrated kidney care. Intermountain Healthcare will use SymphonyRM's artificial intelligence (AI) algorithms combined with predictive analytics to identify patients who are at risk of developing CKD and to create personalized treatment plans for patients that have CKD. Intermountain Healthcare will build from their existing telehealth infrastructure to develop a robust home dialysis program.

Sources: Kent J. Intermountain using artificial intelligence to support kidney health. *Health IT Analytics*. September 6, 2019; Intermountain Healthcare. Treatment & detection methods; Intermountain Healthcare. Kidney care. All websites accessed November 2019.



Providing Integrated Care in a Fee-for-service World

Health systems firmly rooted in fee-for-service can also benefit from integrated kidney care to improve patient outcomes and limit costly preventable ED visits, admissions and readmissions of CKD patients. Since organizations may not be equipped to assume risk, partnering with providers outside of the health system (eg, nephrology practices, dialysis clinics) can address potential gaps in care.

Collaboration with these parties to ensure care coordination and data sharing will be key to providing comprehensive, integrated care to CKD patients. The most impactful strategy will require high initial investment. By addressing upstream social determinants of health, providers can prevent progression to ESRD and high ED utilization down the line. Providers should also identify opportunities to decant volumes to lower-acuity sites, reducing the high rate of ED utilization.

CASE EXAMPLE

The Integrated Partnership of Inova Health System and Somatus

Inova Health System in Virginia and Somatus, a start-up focused on integrated kidney care, developed a partnership in 2017 to care for Inova's chronic kidney disease patients. The program provides services, including care coordination, in-center dialysis, home dialysis, field-based nursing, patient education, a technology platform for benchmarking outcomes and more.

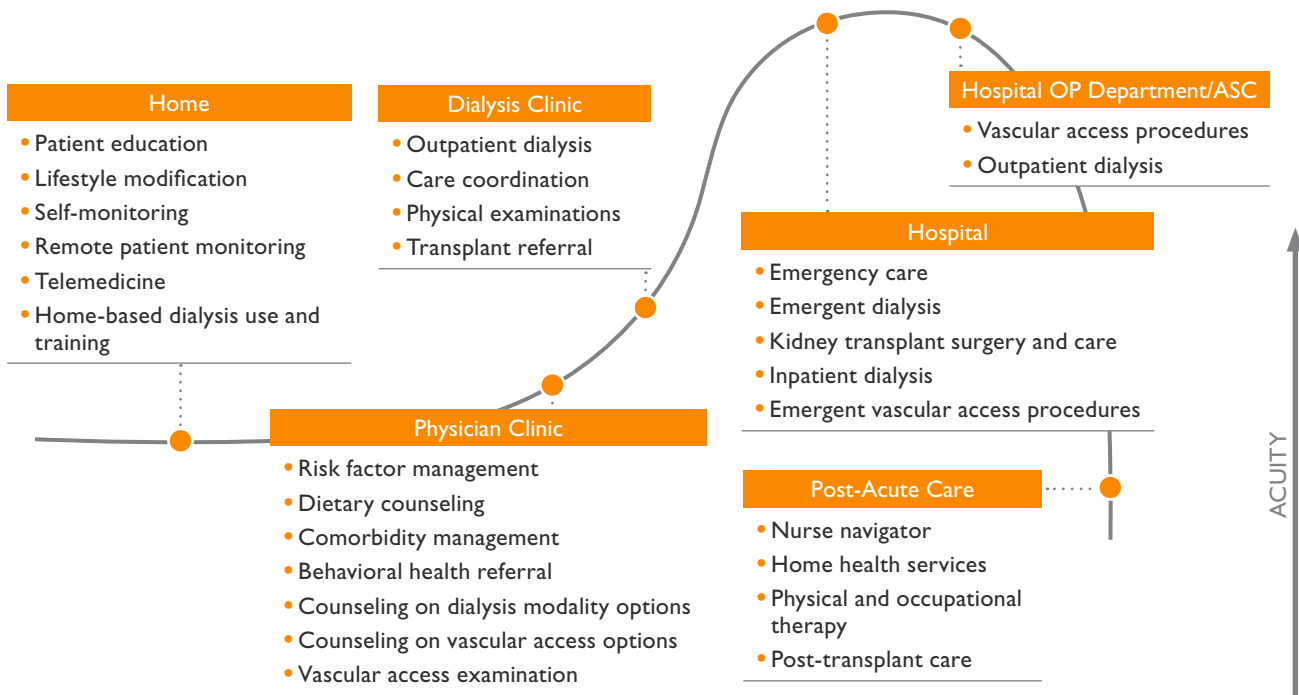
Somatus focuses on increasing the utilization of home dialysis but provides in-center dialysis for patients not suited for home dialysis. Somatus's stated goal is to have 50% of patients on home dialysis. Somatus and Inova have opened 1 dialysis center to date, located in Falls Church, VA. Results are not yet available on the outcomes of this partnership.

Sources: Inova Newsroom. Inova announces Somatus as new acute dialysis provider [press release]. June 26, 2017; Inova Newsroom. Dialysis patients in northern Virginia have a new option at the Falls Church Somatus Dialysis Center. October 8, 2018; Somatus website. Accessed November 2019.

Operationalizing Integrated Kidney Care

Well-integrated programs offer the full continuum of services and seamlessly connect services from beginning to end, as shown in **Figure 1**.

FIGURE 1. CHRONIC KIDNEY DISEASE SYSTEM OF CARE



ASC = ambulatory surgery center; CARE = Clinical Alignment and Resource Effectiveness.



Workforce Needs

Health systems must consider the workforce necessary to support different interventions. Workforce needs will vary based on the size of the CKD/ESRD population and the level to which the health system is integrated with other sites of care, including nephrology practices and dialysis clinics. Integrated care requires the deployment of staff traditionally found in a kidney care program (nurses, nephrologists, transplant coordinators and transplant surgeons) as well as new roles, including field-based dialysis nurses, nurse navigators/kidney care coordinators and patient educators. These new roles can be employed by different stakeholders depending on whether the health system is internally sourcing integrated kidney care, pursuing partnerships, or coordinating with a dialysis clinic or nephrology practice that provides integrated kidney care.

Integrating Throughout the Patient Journey

Although gaps in kidney care are concentrated in CKD prevention, diagnosis and monitoring, ESRD treatment, and the transition to transplant, interventions targeting patient access and education are also critical to delivering integrated care. Health systems that choose to improve access and education should consider approaches that weave through all parts of the patient journey, as shown in **Table 2**.

TABLE 2. STRATEGIES TO PROVIDE CHRONIC KIDNEY DISEASE CARE THROUGHOUT THE PATIENT JOURNEY

GAP	GOAL	INTERVENTIONS	STRATEGY
Poor transitions of care	Coordinate care across both the System of CARE and providers.	<ul style="list-style-type: none"> • Institute team-based care model. • Employ nurse navigator/ kidney care coordinator. • Utilize a care coordination platform. 	Liaise between providers and care sites to ensure patient-centered care throughout the care continuum.
Insufficient patient education	Educate patients effectively at all points during the patient journey (prevention, diagnosis, monitoring, treatment).	<ul style="list-style-type: none"> • Discuss risk factors and treatment options. • Provide in-person education sessions. 	<ul style="list-style-type: none"> • Collaborate with nephrologists to assess patients' social and clinical needs to provide the optimal care plan. • Partner with advocacy group kidney health coaches.
Poor management of comorbidities	Closely manage patient comorbidities.	Regularly monitor exercise level and sodium, alcohol and protein intake.	Leverage telehealth and provide medical nutrition therapy.
Limited attention to patient satisfaction	Focus on patient satisfaction.	Ensure patient-provider shared decision making.	Fully inform patients and family about treatment options and listen to patients' voices in treatment decision making.



Targeted CKD Prevention, Diagnosis and Monitoring

CKD disproportionately affects older adults, people of color and those with low access to care, so targeted interventions directed at these patient populations can yield even greater outcomes and cost savings. **Table 3** outlines opportunities across the System of CARE for early intervention to prevent and delay onset of ESRD.

TABLE 3. STRATEGIES TO PREVENT, DIAGNOSE AND MONITOR CHRONIC KIDNEY DISEASE

GAP	GOAL	INTERVENTIONS	STRATEGY
Social determinants of health not factored into care	Effectively address comorbidity factors and social determinants of health.	<ul style="list-style-type: none"> Mitigate risk factors for diabetes and high blood pressure. Stratify patients based on risk. 	<ul style="list-style-type: none"> Integrate with diabetes prevention programs. Work with nephrologists to monitor sodium and alcohol intake, exercise level, and substance use. Provide annual estimated GFR tests and screenings for patients with diabetes. Leverage EHR data to develop risk stratification.
Significant number of undiagnosed patients	Increase access to nephrology care.	<ul style="list-style-type: none"> Provide transportation to appointments. Perform outreach to communities with reduced access to care. 	<ul style="list-style-type: none"> Partner with rideshare agencies to provide transportation for care. Utilize mobile health vans to screen for risk factors and to provide blood and urine tests.
Poor transition of care following diagnosis	Coordinate care from diagnosis to monitoring.	<ul style="list-style-type: none"> Refer to nephrology specialist early on. Discuss comorbidity factors and monitor for these symptoms during physician office visits. 	<ul style="list-style-type: none"> Develop relationships between primary care physicians and specialists. Distribute educational information materials to physicians and patients.
Poor disease monitoring	Utilize technology to monitor CKD.	<ul style="list-style-type: none"> Track medication adherence. Perform regular CKD monitoring. 	<ul style="list-style-type: none"> Use artificial intelligence to detect CKD at its earliest stages and to remind patients to take their medications. Utilize wearable technology to monitor vital signals and health information. Leverage precision medicine to monitor urinary and serum biomarkers.



ESRD Treatment: Dialysis to Transplant

Most patients with ESRD are on hemodialysis and receive treatment at dialysis centers. **Table 4** outlines the various dialysis options. Approximately 10% of patients start dialysis in a home setting. Over the next decade, however, Sg2 forecasts a 27% increase in the home site of care volume, including home dialysis, remote patient monitoring and other home-based services. Emerging care models, such as hospital at home, will expand the pool of patients that are able to receive home dialysis.

Home-based dialysis improves patient outcomes and increases patient independence as patients can dialyze on their own schedules, including overnight. However, home dialysis increases the risk of infection and low patient compliance. Consequently, home dialysis programs must be equipped to include remote patient monitoring, field-based nurses and robust patient education to mitigate risks.

TABLE 4: DIALYSIS MODALITIES

HEMODIALYSIS	VS	PERITONEAL DIALYSIS
<p>Machine takes blood from the body, filters it through a dialyzer and returns it to the body.</p> <p>Typical setting: Home or in-center</p> <p>Benefit: No risk of peritonitis (infection of peritoneum)</p> <p>Risks:</p> <ul style="list-style-type: none"> • Difficult to administer at home • Requires access through fistula, graft or catheter • Catheter access has risk of bloodstream infection 		<p>Fluid flows from a bag into the patient through a catheter. The fluid cleans out the patient’s blood through the patient’s stomach lining (peritoneum) and then is drained back into the bag.</p> <p>Typical setting: Home</p> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>Benefits:</p> <ul style="list-style-type: none"> • Limited equipment needed • Automated and manual options • Better control of fluid • Increased mobility • More independence </div> <div style="width: 45%;"> <p>Risks:</p> <ul style="list-style-type: none"> • Peritonitis infection • Can lose effectiveness with long-term use • Requires patient mobility and independence </div> </div>

For patients with ESRD, the best treatment option is to receive a kidney transplant because transplants improve outcomes and survival rates. Donated kidneys can come from either live or deceased donors, but they are limited in supply. Health systems must determine the most seamless pathway for patients to transition to transplant, whether through referral to a larger health system with a transplant program, or into the health system’s own transplant program. Kidney transplant programs are discussed in more detail in the Sg2 publication You Asked: Kidney Transplant Landscape. **Table 5** outlines methods for providing integrated kidney care for patients with ESRD.



TABLE 5. STRATEGIES TO EFFECTIVELY MANAGE END-STAGE RENAL DISEASE FROM DIALYSIS TO TRANSPLANT

GAP	GOAL	INTERVENTIONS	STRATEGY
Lack of education on dialysis options	Guide patient access to the appropriate dialysis modality (peritoneal vs hemodialysis and home vs in-center dialysis).	<ul style="list-style-type: none"> • Patient education on modality options • Availability of different modalities 	<ul style="list-style-type: none"> • Develop educational materials. • Partner with a company providing education options. • Partner with a dialysis center or advocacy group on education.
Limited utilization of home dialysis	Provide safe and effective in-home dialysis treatment.	<ul style="list-style-type: none"> • In-home dialysis equipment • Remote patient monitoring • Telehealth visits • Field-based nursing • Patient education on equipment use and infection control 	<ul style="list-style-type: none"> • Partner with a company providing in-home dialysis as part of integrated kidney care. • Create your own in-home dialysis program.
High rates of hospitalization of ESRD patients	Prevent avoidable ED visits, admissions and readmissions.	<ul style="list-style-type: none"> • Remote patient monitoring • Patient engagement platform • Analysis of data to determine risk of hospitalization 	<ul style="list-style-type: none"> • Partner with a kidney care company or build your own capabilities for patient monitoring and engagement. • Use AI and predictive analytics platform to determine hospitalization risks.
Lack of patient education	Increase the number of patients receiving kidney transplant.	<ul style="list-style-type: none"> • Transplant referral counseling • Assistance with finding a living donor 	<ul style="list-style-type: none"> • Partner with advocacy groups to provide resources on how to find a living donor. • Build a living donor program internally.



Sg2 Perspective

Providing integrated care for chronic kidney disease patients across multiple sites of care and providers is a challenge. As CMS begins to address the cost of CKD, and in particular ESRD, health systems will assume increasing responsibility in managing this population throughout the patient journey. This new responsibility presents the opportunity for cost savings for health systems and a significant positive impact on population health initiatives.

Organizations seeking to provide effective care for CKD patients should consider the following strategies:

- Monitor ongoing developments in federal policy for care of CKD patients and possible impacts on health system reimbursement.
- Determine which options for providing integrated kidney care are most suitable to pursue based on market conditions.
- Participate in care coordination alongside nephrology practices and dialysis centers to ensure consistent care for patients at all stages of the disease.
- Assess whether a risk-sharing partnership with a kidney care company would fit with the health system's goals and level of investment into population health.

Sg2 RESOURCES

- Report: *Developing a Market-Driven Chronic Care Strategy*
 - You Asked: Comprehensive Diabetes Care
 - You Asked: Kidney Transplant Landscape
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Sources: National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK). Chronic kidney disease tests & diagnosis. October 2016; CMS. Comprehensive ESRD Model. November 26, 2019; Cope J. New innovation for chronic kidney disease. *RN Journal*; Craven J. A novel—and cost-effective—approach to end-stage renal disease. *First Report Managed Care*. September 2018; National Kidney Foundation. A–Z health guide: dialysis; Liu H and Zhao S. *J Am Soc Nephrol*. 2018;29(11):2612–2615; NIDDK. Identify & evaluate patients with chronic kidney disease; Krishnan M and Thiry K. Innovation in dialysis: continuous improvement and implementation. *NEJM Catalyst*. February 27, 2019; Metzger S. *Nephrol Nurs J*. 2016;43(3):251–254; Vizient. Mitigate rising inpatient dialysis costs by improving efficiency. September 27, 2017; Page R. Continuity of care: chronic kidney disease across the continuum. *Pharmacy Times*. April 1, 2008; United States Renal Data System (USRDS). 2018 USRDS Annual Data Report. 2018; Young EW et al. *Clin J Am Soc Nephrol*. 2019;14(10):1466–1474. All websites accessed November 2019.