CHRONIC KIDNEY DISEASE
CHANGE PACKAGE

Population Health Strategies for Cardiovascular
and Kidney Disease Risk Reduction

CKD intercept

National
Kidney
Foundation®

The National Kidney Foundation (NKF) *Chronic Kidney Disease Change Package* was developed to assist primary care programs to implement systems and strategies that improve care for people living with chronic kidney disease (CKD).

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Chronic kidney disease (CKD): An Unrecognized Public Health Issue

Of the estimated thirty million American adults with CKD, over 80% are unaware of the condition that increases their risk for cardiovascular events and progression to kidney failure and death.[1] Almost 90% of adults with type-2 diabetes and CKD are not currently diagnosed,[2] and as many as 50% of patients with advanced CKD (Stage G4) remain undiagnosed in primary care populations.[3] While CKD is recognized for the costs associated with progression to kidney failure and dialysis, recent data illustrate that unrecognized CKD has significant impact on outcomes and healthcare utilization, beginning with the earliest stages[4] (see figures 1 and 2).

Two tests assess for CKD: estimated glomerular filtration rate (eGFR) and urine albumin-creatinine ratio (ACR). Current guidelines for CKD testing recommend that adults with diabetes and/or hypertension be evaluated at least annually for albuminuria. Less than 10% of those with hypertension and less than 40% of those with diabetes are appropriately assessed[5] (see figure 3). Two large studies have shown that people with both low eGFR and high ACR have increased risk of cardiovascular events and death.[6,7] (see figure 4).

Early recognition and management of CKD allows clinicians more opportunities to protect kidney health. A population health model for CKD including regular assessment, diagnosis, and early intervention. has been shown to favorably impact CKD progression and downstream incidence of ESRD[8] (see figure 5).

Figure 1

Prevelance of CKD
1 in 3 American adults has or is at risk for CKD, and most of them don't know it.

AT RISK FOR CKD–75 million
(due to hypertension or diabetes)

WITH CKD
–30 million

AWARE OF IMPAIRED
KIDNEYS–3.6 million

Figure 2

NO CKD $7,357

STAGE 2 $16,770

STAGE 3 $33,200

STAGE 4-5 $76,969
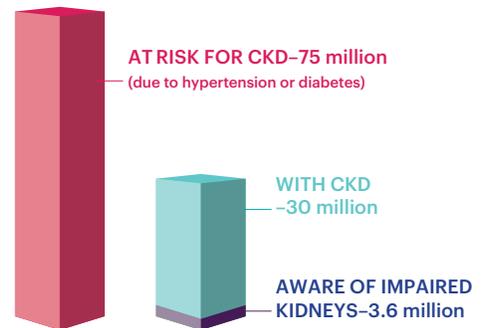
(Annual cost per CKD patient by stage of CKD)

Medical Costs Increase with CKD Progession
Annual treatment costs increase as CKD progresses.

Figure 3

HYPERTENSION

94%
UNTESTED

DIABETES

61%
UNTESTED

HYPERTENSION & DIABETES

60%
UNTESTED

Low Rates of Albumin-Creatinine Testing in CKD
Hypertension and diabetes are the top two risk factors for developing CKD, but many people with these conditions are not receiving recommended testing.

Figure 4

CKD Progression (Estimated GFR)

>=60	**2.11**
45-49	**3.65**
30-44	**11.29**
15-29	**21.8**
<15	**36.6**

Cardiovascular risk increases with CKD progression.

Increasing Cardiovascular Risk ————————————————————>

(Age-Standardized Rates of Cardiovascular Events)

SOURCE: Go , A.S., et al., Chronic kidney disease and the risks of death, cardiovascular events, and hospitalization. *New England Journal of Medicine*, 2004;351(13):1296-1305.

Figure 5

Native American adults have more diabetes than any other race or ethnicity.

Whites	**8%**
Asian Americans	**9%**
Hispanics	**13%**
Blacks	**13%**
Native Americans	**16%**

SOURCE: National Health Interview Survey and Indian Health Service, 2010-2012.

Kidney failure from diabetes in Native Americans has dropped more than any other race or ethnicity.

Per 100,000 people

● **Native Americans** ● **Blacks** ● **Hispanics** ● **Asians** ● **Whites**

1996   2013

SOURCE: United States Renal Data System (USRDS), 1996-2013, adults 18 and older.

In Brief: CKD Diagnosis and Management

Chronic kidney disease is defined as estimated glomerular filtration rate (eGFR) < 60 ml/min/1.73m^2 and/or markers of kidney damage for at least three months[9] (see figure 6). In clinical practice, the most common tests for chronic kidney disease include glomerular filtration rate estimated from the serum creatinine concentration (eGFR) using the CKD-EPI (CKD Epidemiology Collaboration) equation and albuminuria from the urinary albumin-creatinine ratio (ACR).[9]

Assessment of estimated glomerular filtration rate and albuminuria should be performed for persons with diabetes and/or hypertension but is not recommended for the general population.[10]

Management of chronic kidney disease includes reducing the patient's risk of CKD progression and risk of associated complications such as cardiovascular disease, acute kidney injury (AKI), CKD anemia, CKD metabolic acidosis, as well as CKD mineral and bone disorder.

Prevention of chronic kidney disease progression requires individualized blood pressure target that considers < 130/90 mm Hg or higher goals,[11-14] use of ACE inhibitors (ACEi) or angiotensin receptor blockers (ARB) for patients with albuminuria and hypertension,[15-18] hemoglobin A$_{1c}$ ≤ 7% for patients with diabetes,[19,20] and referral for medical nutrition therapy.[21,22]

To reduce patient safety hazards from medications, the level of estimated glomerular filtration rate should be considered when prescribing and nephrotoxins should be generally be avoided such as prolonged use of nonsteroidal anti-inflammatory drugs (NSAIDs).[23-25]

The main reasons to refer to nephrology specialists are estimated glomerular filtration rate < 30 ml/min/1.73m^2, severe albuminuria, undetermined CKD etiology and acute kidney injury.[26]

Figure 6

Risk of Chronic Kidney Disease Progression and Frequency of Assessment

(according to estimated glomerular filtration rate (eGFR) and albumin-creatinine ratio (ACR))

Adults with Diabetes, Hypertension, older than 60, or a family history of kidney disease → Request Kidney Profile (eGFR & ACR)

CKD is classified on the basis of:
- Cause (C)
- GFR (G)
- Albuminuria (A)

			Albuminuria categories Description and range		
			A1	A2	A3
			Normal to mildly increased	Moderately increased	Severly increased
			<30 mg/g <3 mg/mmol	30-299 mg/g 3-29 mg/mmol	≥300 mg/g ≥30 mg/mmol
GFR categories (mL/min/1.73m²) Description and range	G1	Normal or high	≥90	1	1	2
	G2	Mildly decreased	60-89	1	1	2
	G3a	Mildly to moderately decreased	45-59	1	2	3
	G3b	Moderately to severely decreased	30-44	2	3	3
	G4	Severely decreased	15-29	3	3	4+
	G5	Kidney failure	<15	4+	4+	4+

The GFR and albuminuria grid depicts the risk of progression, morbidity, and mortality by color, from best to worst (green, yellow, orange, red, deep red).

The numbers in the boxes are a guide to the frequency of assessment annually.

■ Green: annual assessment for those at risk. (Green can reflect CKD with normal eGFR and albumin-to-creatinine ratio (ACR) only in the presence of other markers of kidney damage, such as imaging showing polycystic kidney disease or kidney biopsy abnormalities)

■ Yellow: suggests assessment at least once per year;

■ Orange: suggests assessment twice per year;

■ Red: suggests assessment three times annually;

■ Deep red: suggests assessment four times each year.

These are general parameters only, based on expert opinion and must take into account underlying comorbid conditions and disease state, as well as the likelihood of impacting a change in management for any individual patient.

Vassalotti JA, Centor R, Turner BJ, Greer RC, Choi M, Sequist TD; National Kidney Foundation Kidney Disease Outcomes Quality Initiative. Practical Approach to Detection and Management of Chronic Kidney Disease for the Primary Care Clinician. Am J Med. 2016 Feb;129(2):153-162.e7.

What is the CKD Change Package?

The contents of this document represent a list of suggested process improvements that ambulatory care can utilize to improve chronic kidney disease (CKD) screening, recognition and management. This also includes discussion of these change concepts and change ideas taken directly from interviews with teams that have integrated CKD care into ambulatory care settings.

This document follows the format of the Million Hearts Hypertension Change Package in compiling change concepts, change ideas, evidence- or practice-based tools and resources:

> *"Change concepts are general notions that are useful in the development of more specific ideas for changes that lead to improvement. Change ideas are actionable, specific ideas for changing a process. Change ideas can be rapidly tested on a small scale to determine whether they result in improvements in the local environment."*

Interviews were conducted in January/February 2018 with clinical teams that have implemented CKD processes of care in ambulatory care.

Most of the language included in this document arises directly from statements shared during the interview process. It reflects an aggregate of the comments from the teams interviewed. The text included in italics is direct quotes from these interviews.

Abbreviations

AHRQ: Agency for Healthcare Research and Quality, Rockville, MD

Buffalo: Department of Family Medicine, University at Buffalo, Buffalo, NY

CDC: Centers for Disease Control and Prevention, Atlanta, GA

Harvard: Harvard Vanguard Medical Associates, Boston, MA

Intermountain: Intermountain Health System, Salt Lake City, UT

IHS: Indian Health Services, Rockville, MD

Kaiser Permanente: Kaiser Permanente Hawaii, Division of Nephrology

Medical Associates Clinic: Medical Associates Clinic, Dubuque, IA

Medline: Medline Plus Connect[39]

Minnesota: Division of Renal Diseases and Hypertension, University of Minnesota, Minneapolis, Minnesota

MUSC: Division of General Internal Medicine and Geriatrics, Medical University of South Carolina, Charleston, SC

NIDDK: National Institute of Diabetes and Digestive and Kidney Diseases, Bethesda, MD

NKDEP: National Kidney Disease Education Program, Bethesda, MD

NKF: National Kidney Foundation, New York, NY

Plymouth Family Physicians: Plymouth Family Physicians, Plymouth, WI

UNYNET: Upstate New York Practice Research Network, Buffalo, NY

STRATEGIES FOR INTEGRATING CKD CARE PROCESSES

Develop the Strategy for CKD Initiative Implementation

Identify CKD impact on the institution

For many organizations, the first step to implementing a CKD program is to increase the visibility of CKD as an important entity to follow. There is a high awareness threshold regarding CKD that must be overcome within the institution outside of nephrology. The full burden of CKD must be clearly understood across the institution for a CKD program to be successful.

To achieve this, it is suggested that a strong analysis of CKD be created from both a financial and morbidity/mortality perspective. As CKD is a laboratory diagnosis, available laboratory data can be utilized to determine the depth of under-recognition. Gaps in assessment of at-risk populations or delivery of optimal standards of care can be assessed through analysis of EHR data. Some organizations have utilized ongoing diabetes audits or established diabetes cohorts to ascertain the quality of CKD prevention.

Underscore CKD's role as a disease multiplier for cardiovascular disease (CVD) and provide evidence that demonstrates its impact on downstream outcomes within diabetes and hypertension. Consider using CKD as an example of a risk stratification to better leverage team-based primary care.

"Emphasize the importance of CKD in the hypertension world illustrating how CKD and uncontrolled hypertension represent significant increased risk for the network in downstream events. Make this point crystal clear for the institution's leadership."

"Our network was trying to figure out how to utilize team-based care. Management of CKD is a nice way to illustrate this. Being able to easily identify who should go where and who was responsible for what was appealing to our leadership. The simplicity of CKD recognition and diagnosis using lab values added to its appeal for inclusion in a population health model."

Consider novel perspectives or sources of data to build your CKD business case. Employee health insurance claims can build real-time financial arguments for CKD prevention and management by illustrating the percentage of the institution's annual health spend that it generates. Also, the evaluation of CKD costs on value-based contracts within the institution can provide financial arguments for implementation of a CKD program.

It is important to be realistic in your assessment of the impact of CKD. Offer a plan that suggests meaningful solutions to the problem. And communicate that CKD progresses over time and that the return-on-investment from the CKD program will be realized over the course of the disease.

"There is a good return on investment (ROI) from improving CKD care, but it is a process that occurs over time; the ROI is not as immediate as investing in diabetes (DM) or congestive heart failure (CHF)"

Engage important stakeholders in the campaign to include CKD in primary care

It is important to engage the highest level of medical leadership in these discussions. Take a broad view of the organizational leadership and include the Chief Medical Officer, Director of Primary Care, Director of Quality Improvement (QI) for the network, Director of Pharmacy, etc.

> *"Evangelize leadership to align behind this initiative and to communicate from the top down regarding focus and process ensuring that they recognize that a CKD program could represent a total system redesign."*

Primary care leaders should spearhead this intervention and be fully engaged in the **initial conversations** regarding CKD in a population health model. Broad stakeholder engagement ensures that the team providing care is represented and it facilitates implementation of the program. Include atypical stakeholders like a physician/hospital organization or employee benefit representative to provide support for the CKD program.

> *"The team that developed our CKD program included representatives from the Emergency Department, Family Practice, Internal Medicine, advanced care practitioners, ancillary staff, Nephrology, Population Health and Information Technology."*

An ongoing investment in maintaining leadership support will contribute to the success of the program and the long-term implementation of new strategies in primary care. Keep CKD in Quality Improvement conversations at the highest levels of organizational leadership by clearly and repeatedly articulating the win-win for the network or practice.

> *"Be patient. There is a long lead-time to form relationships with primary care and to get everyone on the page of recognizing CKD as an important risk stratefier."*

Change Concepts	Change Ideas	Tools and Resources
Make CKD recognition and management an organizational priority	Identify CKD impact on the institution.[4]	NKF: Data mining tool[40]
		NKDEP: HIT Workgroup CKD Financial Model[41]

Define the CKD Intervention to be Employed

Develop a multi-disciplinary team to define the organizational CKD strategy

Engage a broad, multi-disciplinary team in the development of a chronic kidney disease strategy for the institution. This team may include representatives from primary care, nephrology, quality, data analysis [populytics or population health], accountable care, electronic medical record (EMR) design/development, nursing, etc. For integrated institutions it is also recommended to include representatives from emergency medicine, nutrition, etc. Include IT resources in the conversation to leverage technology to make the process as dynamic as possible.

| *"Make CKD care a team sport."*

Engage the clinicians most appropriate to the complexity of the patient, including physicians, nurse practitioners, physician assistants, nurses, dietitians, pharmacists, behavioral health providers and community health workers on the care team. Consider integrating clinical pharmacy into the care path for hypertension and CKD. Define a scope of practice where pharmacists conduct medication reconciliation, patient education, adjust dosages, and provide in-between visit contact. Ensure that the strategy developed allows everyone to practice at the top of their license.

Identify guidelines for CKD care to be implemented into primary care

Ensure that CKD recognition is included as a performance measure and that the program recommended is flexible in its design. Encourage program development that builds relationships among the care team and with patients to provide the consistent, overarching relationships that ensure continuity of care. Take a proactive posture that advances a culture of CKD prevention which stresses blood pressure control and A1c management.

Recommend CKD testing for risk stratification in a population health model underscoring the simplicity of CKD recognition and diagnosis. Clearly articulate the expected standards of care and make them easily accessible for clinicians.

The NKF recommends the following activities be implemented for CKD care in primary care:

- Annual CKD testing and risk stratification in at-risk populations (eGFR and ACR)[7,10,27]

- Blood pressure control[11-14]

- A1c control[19,20]

- Use of ACE Inhibitor or Angiotensin Receptor Blocker[15-18]

- Use of Statins[28]

- Medical Nutrition Therapy Referral[21,22,29]

- NSAIDs Avoidance counseling[23-25,30]

- Appropriate collaboration with nephrology (see below)[26]

- Use of a risk prediction model (i.e., the Kidney Failure Risk Equation)[31]

There are a number of hypertension guidelines that recommend blood pressure targets for people with CKD. These recommendations should be individualized to the clinical status of each patient. Factors that may be considered to individualize the blood pressure target include: the method of BP measurement, primary and secondary cardiovascular risk, level of albuminuria, age, history of falls, and orthostatic hypotension.

Build internal consensus regarding the CKD metrics to be evaluated in primary care. Clearly articulate the performance measures to be achieved. Precision in the elements of care to be implemented improves the ability of the analytics teams to find and use data. At the very least capture eGFR and albuminuria for CKD among at-risk populations.

Review organizational population health data to identify specific opportunities for improvement

Use tools to identify those at risk of progression and start the conversation there. Start with the population most at risk of progression where interventions will have the biggest impact. Leverage tools, such as the Tangri Kidney Failure Risk Equation[31], to evaluate risk of progression and focus your efforts there initially.

When possible, insert CKD-related metrics into existing practice workflows

Be sensitive to time pressures in primary care. When you can, increase alignment of CKD with diabetes or hypertension workflows and processes to avoid additional impact on the clinician's time. Determine the lens through which CKD will be approached. Consider adding CKD metrics to broader care pathways like health maintenance.

Clearly define the intervention to be employed and develop supporting materials

Start by running a small trial before widening to the entire practice or network. Align the strategies proposed with appropriate practice resources. Make the program design flexible to allow for variation within the practices.

> *"It is important to remember that the system itself will evolve so planning for that evolution in initial program design is important."*

Ensure that the intervention defined aligns closely with the challenges at the practice level. Be sure to develop and deploy systems that complement and accentuate the existing care processes. Include the entire practice team (clinician, nursing, allied health and clinic extenders) in designing the protocols.

> *"Heavily co-designed workflows help with accountability in the process."*

Change Concepts	Change Ideas	Tools and Resources
Define an organizational strategy to support CKD recognition and care in the early stages of the disease	Identify guidelines for CKD care to be recommended for implementation in primary care.	NKF Kidney Disease Outcomes Quality Initiative (NKF KDOQI)™ Clinical practice guidelines[42]
	Build internal consensus around the CKD metrics to be evaluated in primary care. NKF recommendations include: • Annual CKD testing and risk stratification in at-risk populations (eGFR and ACR)[7,10,27] • Blood pressure control[11-14] • A1c control[19,20] • Use of ACE Inhibitor or Angiotensin Receptor Blocker[15-18] • Use of Statins[28] • Medical Nutrition Therapy Referral[21,22,29] • NSAIDs Avoidance counseling[23-25,30] • Appropriate collaboration with nephrology (see below)[26] • Use of a risk prediction model (i.e., the Kidney Failure Risk Equation)[31]	NKF: eGFR Calculator[43] NKF: CKD Risk Assessment Tool[44] NKF: CKD Care Algorithm[45] Kidney Failure Risk Equation[46] Associated LOINC panel[47]
	Clearly define the intervention to be employed and develop supporting materials	Harvard: Implementation of a CKD Checklist for Primary Care Providers[32,48] Buffalo: Improving evidence-based primary care for chronic kidney disease: study protocol for a cluster randomized control trial for translating evidence into practice (TRANSLATE CKD)[33,49] Buffalo: Chronic Kidney Disease Management Algorithm[50] Harvard: Physician and Patient Tools for Improve Chronic Kidney Disease Care.[34,51] UNYNET: CKD Quick Reference for Primary Care[52]

Implement the CKD Strategy that supports CKD recognition and management in its earliest stages

Use population health data to engage clinicians in the need for improvements in CKD care delivery

Provide meaningful data to illuminate care gaps on a regular basis to improve clinician engagement in CKD care. Start with a practice assessment. Inventory the practice to determine where the issues lie. Determine if real-time data capture can be initiated.

> *"We have to orient from the frame that primary care clinicians want to provide quality care for the patients they support. Primary care clinicians may not recognize or realize clinical deficits because they are not given active and appropriate feedback"*

Bring data down to the practice team level. Provide clinicians an assessment of CKD care delivery and/or lists of patients with CKD that require attention. This offers clinicians a discreet list of patients they can impact, focusing their efforts.

Engage practice staff in education regarding CKD assessment and management

Engage the entire team on-site. Emphasize the importance of team-based care with complex CKD patients. Demystify CKD and CKD care. Everyone on the team can be engaged in the planning, CKD education, and operationalizing the program.

> *"As you conceptualize the ideal workflow across different specialties and levels of caregivers, the entire spectrum needs to be retrained to embrace the new care environment. Multi-disciplinary approaches embrace training teams together on this concept of care delivery."*

Make CKD solutions and education simple. Try to keep educational materials simple and short. Stress risk stratification as an important part of this program. Institute training and support for early transplant recommendations as well as other modalities of care.

> *"Make sure to provide tools that will help facilitate this process - instead of simply saying it's a big problem say: here's the data, here's what we know about existing care gaps, here are the strategies that will work to help close them."*

Ensure that the program includes the time and resources for the basic change management necessary to overcome the inherent human difficulties in processing a new way of doing things. Help practice resources to understand how to align the "system" with the desired outcomes.

> *"Address the question of how to align the "system" with the desired outcomes recognizing that the "system" includes people."*

The implementation of this process should be treated as a change initiative, not an educational event. Repetition and ongoing support is key.

Engage practice staff in the refinement and application of the intervention in their own workflows

Engage the practice team in tailoring the intervention to work best with their own practice workflows. Determine what is currently happening in the practice/clinic. What is their current practice toward population health? Is patient outreach occurring or are patients just scheduling visits themselves? What level of team-based care is currently employed? The practice needs should frame the intervention and tools to be employed.

"Allow the individual practices/practice teams to conceptualize their own care path to address the specifics of their own environment."

Work with the leadership of each individual practice/clinic to determine what QI strategy works best for them.

"It works better if all stakeholders are working together from the beginning to define the interventions and strategy for implementation."

Change Concepts	Change Ideas	Tools and Resources
Implement a CKD initiative that supports CKD recognition and management in its earliest stages	Use population health data to engage clinicians in the need for improvements in CKD care delivery.	**Minnesota**: CKD as a Model for Improving Chronic Disease Care through Electronic Health Records.[36,53] **NIDDK**: CKD Population Health Use Cases[54] **CDC**: MMWR Relevant to IHS Use Case[55]
	Engage the practice staff in education regarding CKD assessment and management.	**NKF**: CKDinform[56] **Buffalo**: Key Points in the Treatment of Chronic Kidney Disease[57]

Use Data to Drive Improvements in CKD care

Establish a CKD registry within EMR system

Establish a CKD registry specifically for primary care patients. Work with your EMR to support CKD data collection. Once established, the registry can automatically identify people with CKD and notify the clinician of the need for intervention.

Implement CKD care pathways to support ongoing management

Ensure a multi-disciplinary approach is taken to the development of a CKD-related care path. Develop a committee to include nephrologists, primary care clinicians and advanced practitioners, emergency medicine clinicians, allied health (general and nephrology specific), population health resources, accountable care representatives, network quality representatives, EMR superusers, information technology, etc., to formulate an institutional care pathway. Be sure to integrate feedback from dietitians/nutritionists and behavioral health team members for psycho-social support.

> *"Our care path facilitates primary care to be the manager of CKD until it is necessary to get specialists involved."*

Work with a team to identify those processes that can be automated (i.e. electronic algorithms such as CKD identification), those processes that do not involve medical decision making (i.e. lab orders, immunizations, etc.) and can be "protocolized" to be supported by advanced practitioners, nurses and non-clinical staff.

> *"Set up the system so that the clinical staff can do the work that a physician doesn't have to do. Get everyone working at the top of their license. Set it up so that it is much easier for the clinician to do the work they really need to do."*

Implement electronic decision support for CKD

Work with a CKD committee to define the processes that can be automated within a CKD care pathway and build consensus around their implementation in the EMR/registry. Integrate evidence-based guidelines into primary care EMR including labs to order, use of ACE/ARB, when to refer, etc. Include electronic reminders in the EMR. Make sure that the system alerts are appropriate to the members of the care team and their specific responsibilities.

> *"Ensure that alerts are specifically associated with members of the care team in terms of priority of response."*

Provide electronic order sets to streamline the management process. Allow for standing orders to address non-medical decision-making tasks (ordering labs, etc.). Include standardized templates (order sets) to cover interventions/support from nursing and pharmacy staff. Include orders for annual evaluation of ACR.

Incorporate CKD metrics into ongoing feedback on quality performance (including practice dashboards)

Ongoing reinforcement is necessary to maintain change overtime. Provide closed-feedback loops to advance and monitor CKD quality improvement. It is recommended to implement at least one important CKD metric in dashboards within primary care to make sure that clinicians can recognize the clinical deficit by ensuring that they have accurate, appropriate and timely feedback.

"Practices are provided tools that allow them to see how they are doing. They receive ongoing electronic feedback on the quality of diabetes care in their practice—this includes data on eGFR/ACR testing."

Provide data to improve calibration between clinician intent and actual outcomes.

"Embrace a plan where data is user friendly, intuitive and available to track progress so that resources can be provided to redirect and re-educate clinicians as the program moves forward."

Change Concepts	Change Ideas	Tools and Resources
Use Data to Drive Improvements in CKD care	Establish a CKD registry within the EMR system.	NKDEP: Computable Phenotype description is available in this meeting summary (page 2):[35,58] Harvard: Physician and Patient Tools for Improve Chronic Kidney Disease Care.[34,51]
	Implement CKD care pathways to support ongoing management	Intermountain: Health System CKD Care Process Model[59]
	Implement electronic decision support for CKD	Harvard: Physician and Patient Tools for Improve Chronic Kidney Disease Care.[34,51] MUSC: Use of Clinical Decision Support to Improve Primary Care Identification and Management of Chronic Kidney Disease (CKD)[36,60]
	Incorporate CKD metrics into ongoing feedback on quality performance (including practice dashboards)	Buffalo: Maintaining Quality Improvements in CKD Care.[37,84] Plymouth Family Physicians: PPRNet Practice Performance Report, Quarter ended December 31, 2017[61]

Implement parameters for nephrology referral and co-management of CKD

Clearly articulate parameters for referral

To improve communication and collaboration between primary care and nephrology, where possible, bring nephrology and primary care together to define the relationship that will exist among them. Transparency, communication, clarity about of objectives and ongoing feedback will help. Clearly articulate the parameters for referral particularly the goal for the referral.

Change Concepts	Change Ideas	Tools and Resources
Implement parameters for appropriate collaboration with nephrology and co-management of CKD	Clearly articulate the parameters for appropriate collaboration with nephrology.	**NKDEP:** Nephrologist Collaboration content[62] **NKDEP:** Nephrology referral form[63] **Kaiser:** Effects of proactive population-based nephrologist oversight on progression of chronic kidney disease: a retrospective control analysis[38,64]
	Create a strategy for seamless communication among various members of the advanced CKD care team.	**NKDEP:** • CKD Care Plan[65] • Personas and Scenarios • Data elements **NKDEP:** Resources for Interdisciplinary Team: • Making sense of CKD: A concise guide for managing CKD in the Primary Care Setting[66] • Professional Education for dietitians, pharmacists and diabetes educators[67] • Kidney Disease Education Lesson Builder[68] • Collaborate with a Registered Dietitian[69] • MNT Referral form[70] **Kaiser:** Effects of proactive population-based nephrologist oversight on progression of chronic kidney disease: a retrospective control analysis[38,64]

Take a broad view of CKD patient engagement and education

Encourage everyone to take a broad view of health care which addresses the social determinants of health, including food insecurity, lack of transportation, health literacy, and other challenges associated with poverty and discrimination. Encourage the clinical staff to see the clinic's walls as permeable and to assist patients with these larger issues in their lives. Patient engagement is key.

Engage early. Train diabetes educators to discuss CKD and include it in their existing programming.

> *"CKD doesn't hurt - people aren't aware of it until they are far into the process. Engage patients early so they are prepared and can focus on prevention instead of treatment."*

Create easily digestible patient education. Make CKD patient education a seamless experience in primary care by embedding CKD patient education in the EMR.

Change Concepts	Change Ideas	Tools and Resources
Take a broad view of CKD patient engagement.	Employ community health workers to build relationships within the community.	AHRQ: Community Health Work Innovations[71] NKDEP: Riñones, Tesoros (Kidneys, Treasures) Education Program for Community Health Workers[72]
	Assess "social determinants" stressors: i.e., food insecurity, housing instability, transportation issues, etc.	IHS: Food Insecurity Assessment[73] NKDEP: Various data standards for SDOH noted in e-care plan data elements ("Health Concerns" tab, starting on row 45[74] Challenges for treatment plan maintenance LOINC panel[75]
	Utilize multiple channels of outreach to engage patients around CKD awareness and screening.	Harvard: Physician and Patient Tools for Improve Chronic Kidney Disease Care.[34,76]
	Encourage enrollment in local support groups or peer-mentoring programs.	NKF: Peers, Peer Mentoring[77]
Improve CKD patient education	Develop/utilize CKD-specific education materials.	NKF: A to Z Guide[78] NKDEP: Patient Education Materials: • English[79] • Spanish[80] Harvard: Physician and Patient Tools for Improve Chronic Kidney Disease Care.[34,81] Medical Associates Clinic: Chronic Kidney Disease: A Patient's Guide[82]
	Make CKD patient education a seamless experience in primary care.	Medline: Medline Plus Connect: Linking Portals and EHRs to Consumer Health Content[83]

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