# Population Health Approaches to CKD in Primary Care: Opportunities to Improve Quality of Care, Reduce Cardiovascular Risk and Address Health Inequities

**Mirna Boumitri, MD, MHA (University of Minnesota)**
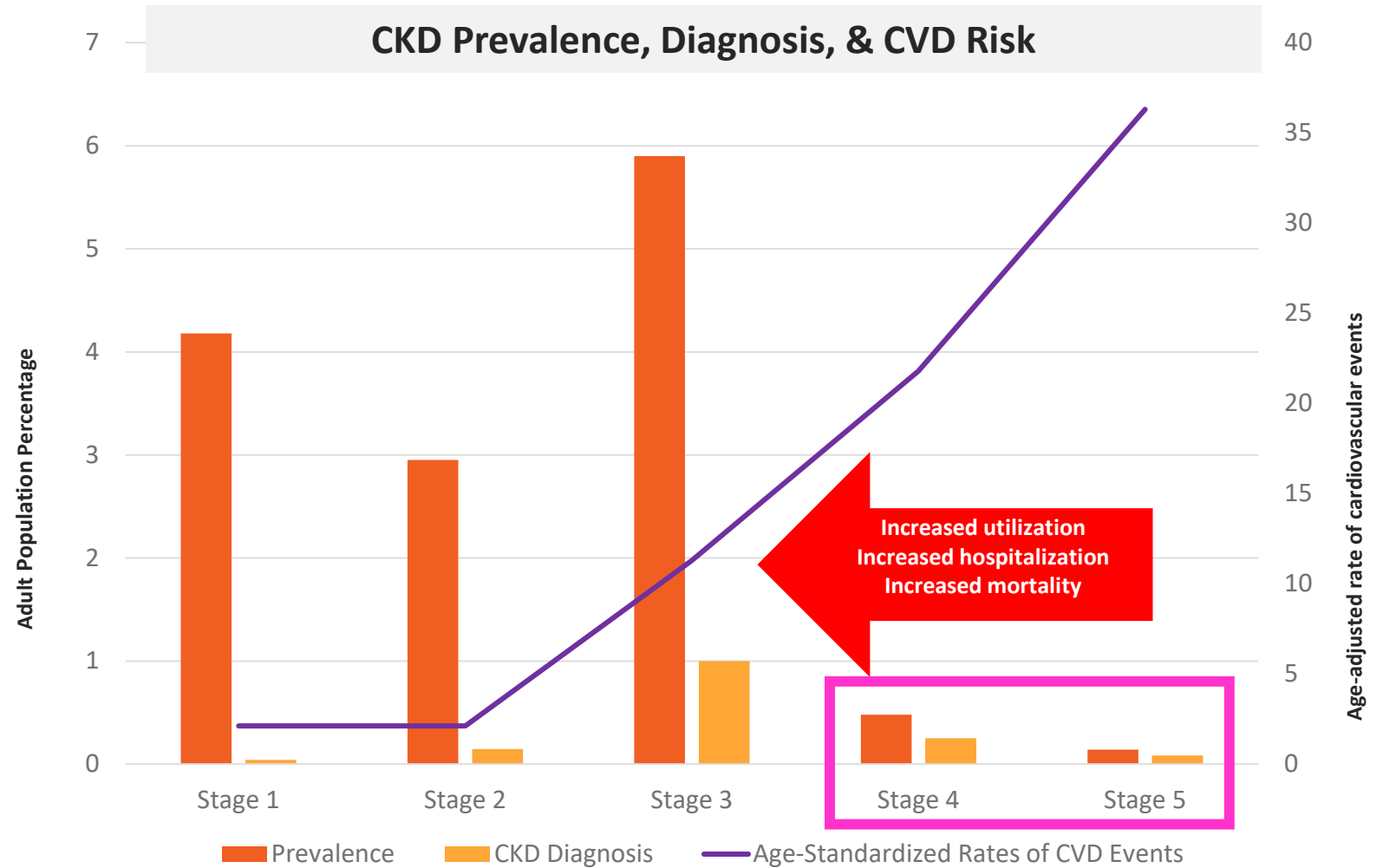**Claire Johnson (NKF)**

# Learning Objectives

- Describe the risk factors of CKD, gaps in testing, and complications of undiagnosed CKD, including cardiovascular impacts.

- Analyze the population health impacts of undiagnosed CKD within their practices and build a case for quality improvement.

- Describe quality improvement strategies that can be deployed in Health Care Homes to improve CKD population health and chronic disease outcomes.

# Overview of CKD, Complications, and Health Equity

# Chronic Kidney Disease

- Affects 15% of adult population

  - 37 million Americans

- In Minnesota

  - **640,000 adults affected** with only **77,000 adults** aware of it.

- Represents 15% of Medicare population but represents 25% of the spend.

- **90% remain undetected in primary care**

  - Including almost 40% of people in stage 5

## CKD Prevalence, Diagnosis, & CVD Risk



Increased utilization
Increased hospitalization
Increased mortality

Legend: Prevalence | CKD Diagnosis | Age-Standardized Rates of CVD Events

X-axis: Stage 1, Stage 2, Stage 3, Stage 4, Stage 5
Left Y-axis: Adult Population Percentage (0–7)
Right Y-axis: Age-adjusted rate of cardiovascular events (0–40)

United States Renal Data System. 2015 USRDS annual data report: Epidemiology of Kidney Disease in the United States. National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases, Bethesda, MD, 2015.

Szczech, L.A., et al., *Primary care detection of chronic kidney disease in adults with type-2 diabetes: the ADD-CKD Study (awareness, detection and drug therapy in type 2 diabetes and chronic kidney disease).* PloS one, 2014. 9(11): p. e110535.

Go AS, Chertow GM, Fan D, McCulloch CE, Hsu C-y. Chronic Kidney Disease and the Risks of Death, Cardiovascular Events, and Hospitalization. *New England Journal of Medicine*. 2004;351(13):1296-1305.
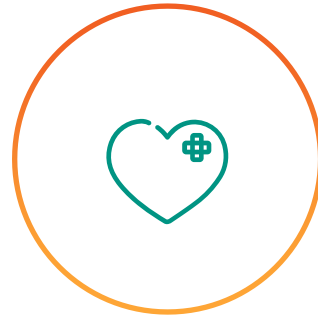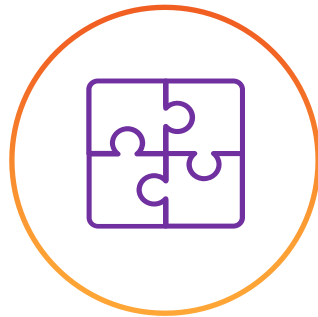
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# Recognition of CKD Risk Factors

**Diabetes**

**High Blood Pressure**

**Cardiovascular Disease**

**Older Age**

**Social Determinants of Health**
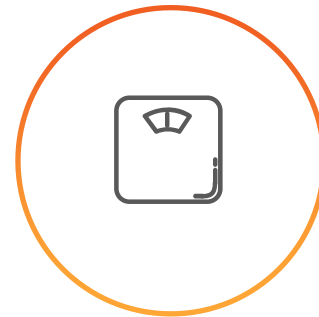
**Obesity**

**Family History of CKD**

**Personal History of AKI**

- US Centers for Disease Control and Prevention. CKD Risk Factors and Prevention. https://www.cdc.gov/kidneydisease/publications-resources/annual-report/ckd-risk-prevention.html

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## Disparities in kidney disease

**Stage 1**
- No differences in CKD prevalence across population subgroups
- Limited genetic contribution

**Stage 2**

**Stage 3**

We must better understand the multiple factors that conspire to influence progression to ESRD.

**Stage 4**

Communities of Color disproportionately affected

Less likely to:
- receive timely referral to nephrology

**Implementing quality improvement activities to close gaps is only one solution**
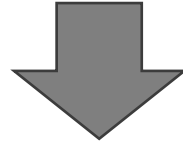
**Stage 5**

Communities of Color disproportionately affected

Less likely to:

- Be on home dialysis modalities
- receive fistula
- be identified as a candidate for transplant
- be referred for evaluation
- complete the transplant evaluation
- be placed on the waiting list
- secure a living donor
- receive a kidney transplant

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# CKD Detection Remains Low in Primary Care Settings

- **15-month medical record review.**
  - **9339 adults with T2DM**
  - **466 investigator sites**

- **5036 (54.1%) had Stage G1–5 CKD based on Egfr or proteinuria**

- **Only 607 (12.1%) of those patients were identified as having CKD by their clinicians.**
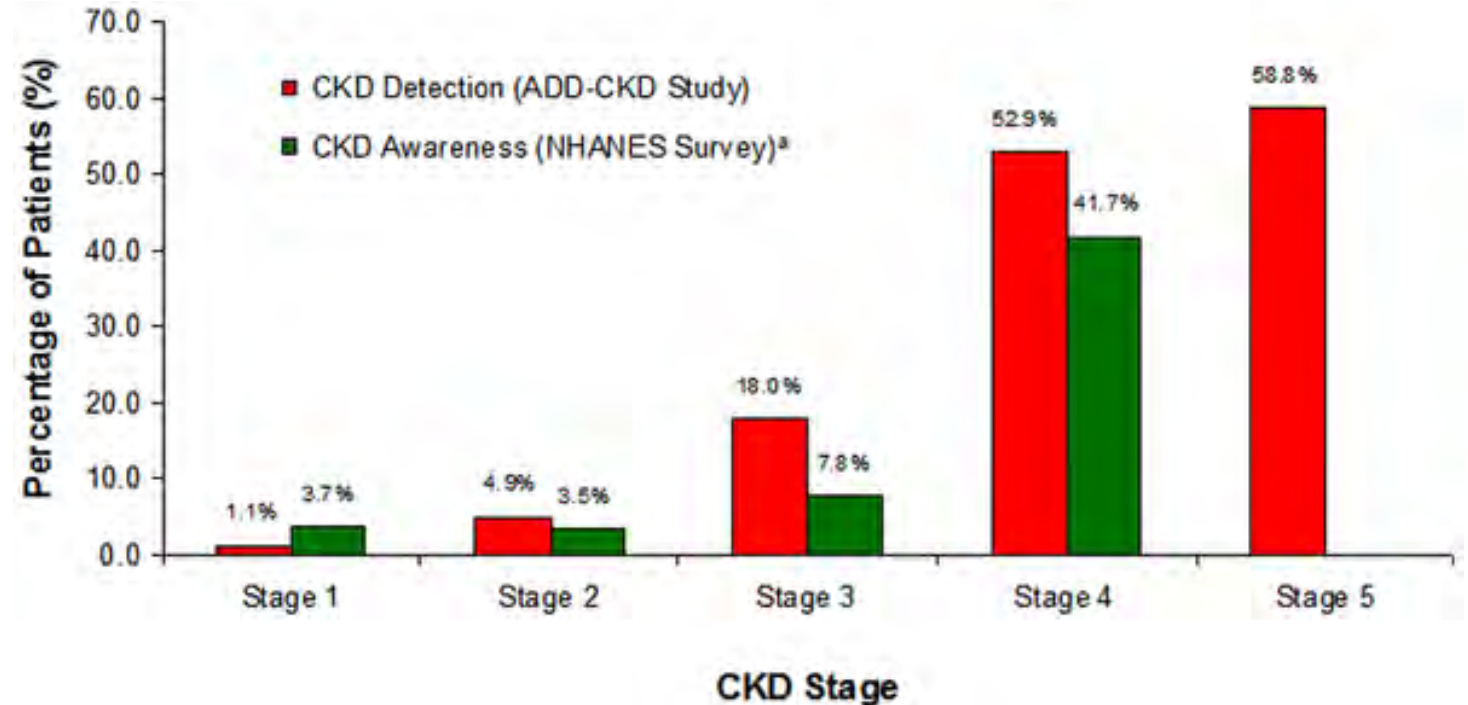


Chart legend:
- CKD Detection (ADD-CKD Study)
- CKD Awareness (NHANES Survey)[a]

Y-axis: Percentage of Patients (%)
X-axis: CKD Stage

| CKD Stage | CKD Detection (ADD-CKD Study) | CKD Awareness (NHANES Survey) |
|-----------|------------------------------|-------------------------------|
| Stage 1 | 1.1% | 3.7% |
| Stage 2 | 4.9% | 3.5% |
| Stage 3 | 18.0% | 7.8% |
| Stage 4 | 52.9% | 41.7% |
| Stage 5 | 58.8% | |

Szczech, L.A., et al., *Primary care detection of chronic kidney disease in adults with type-2 diabetes: the ADD-CKD Study (awareness, detection and drug therapy in type 2 diabetes and chronic kidney disease).* PloS one, 2014. **9**(11): p. e110535.

Plantinga et al. Patient Awareness of CKD Trends and predictors, 2008.

ANNUALIZED MEAN MEDICAL COSTS IN TOTAL (95% CIS) AND BY RESOURCE ADJUSTED FOR AGE, SEX, AND RACE/ETHNICITY.
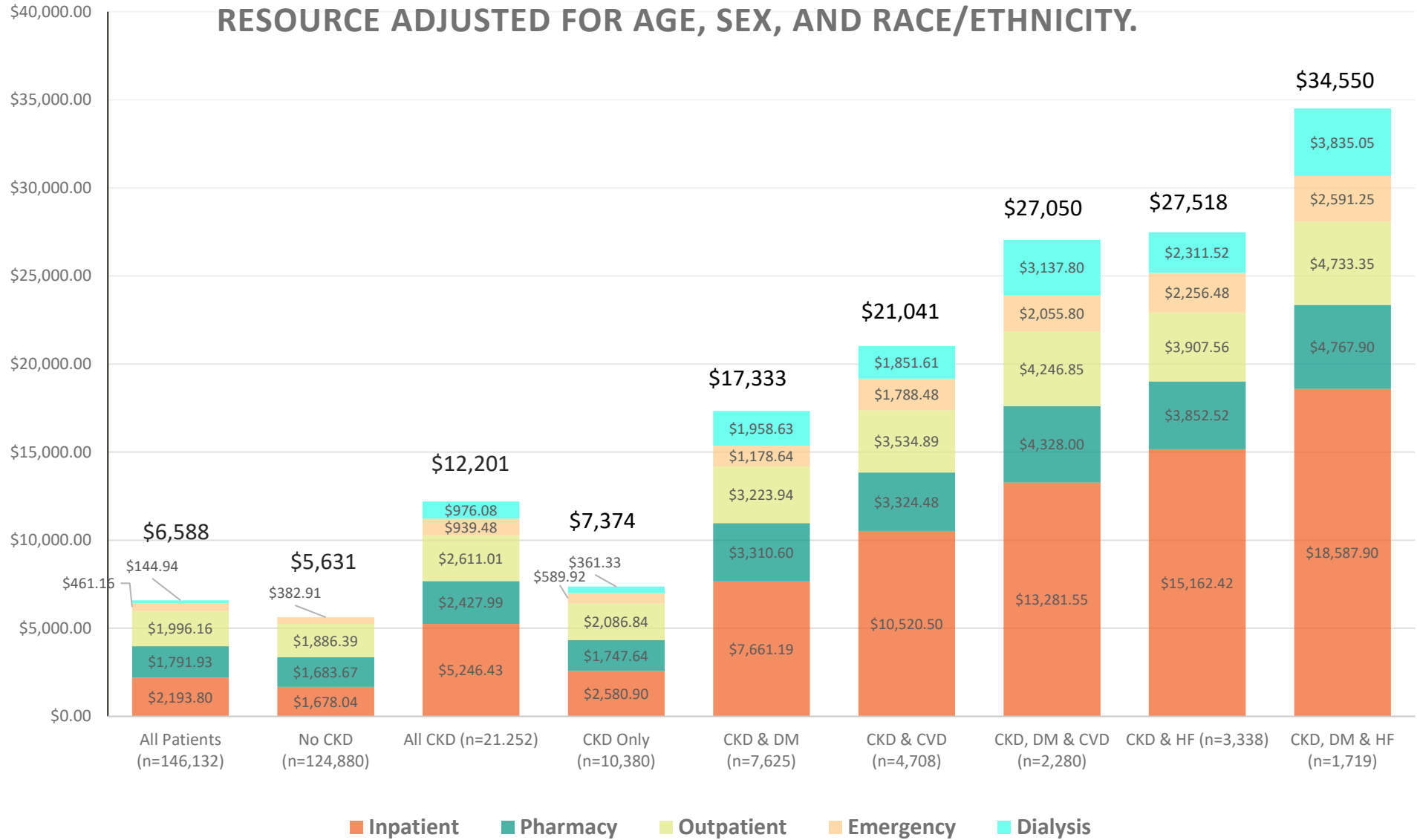
**Two guideline-recommended tests to diagnose and risk stratify CKD:**
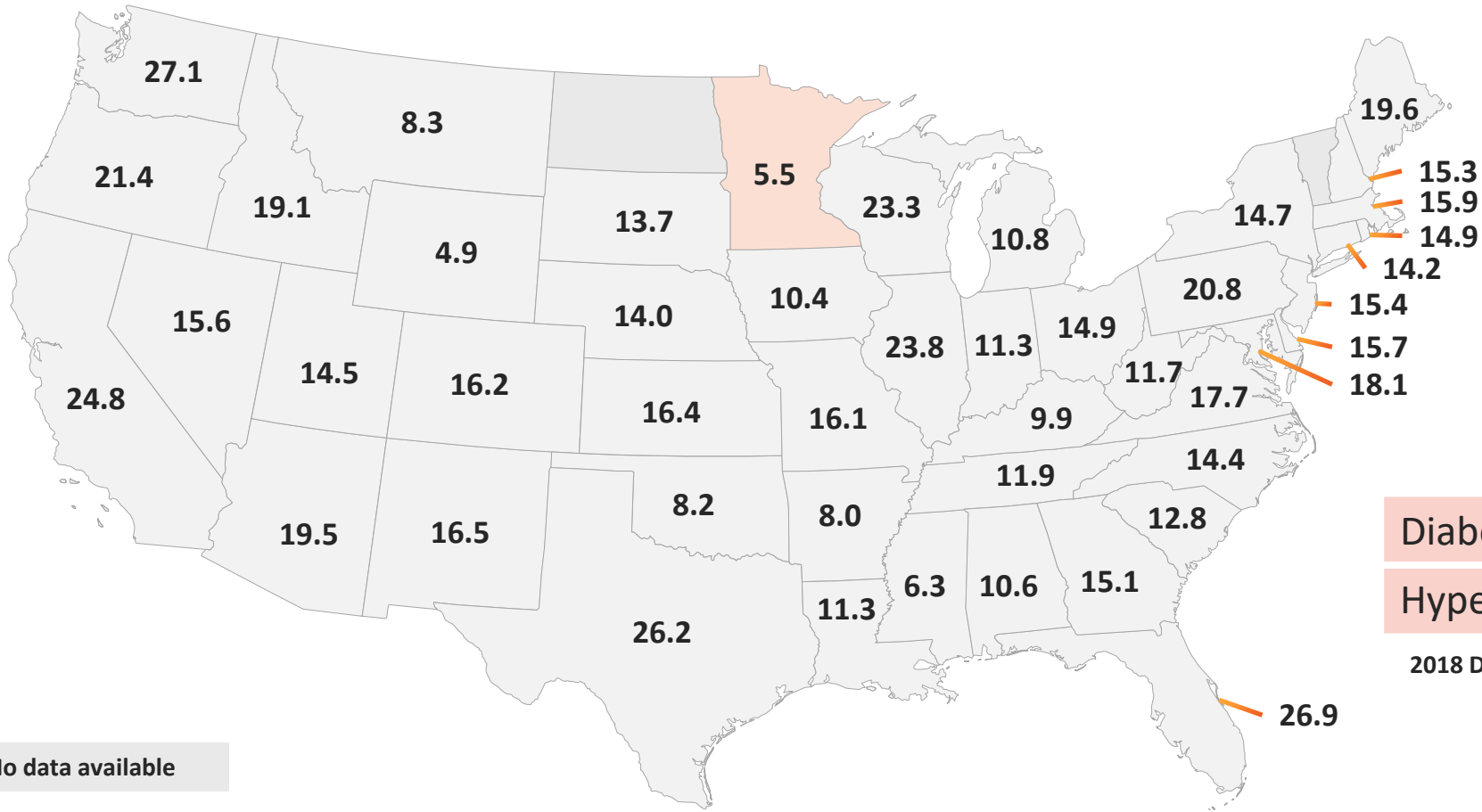
Serum creatinine with eGFR

Urine albumin-creatinine ratio

## Classification of CKD Based on GFR and Albuminuria Categories: "Heat Map"

**Prognosis of CKD by GFR and Albuminuria Categories**

| | | | | Albuminuria categories Description and range | | |
|---|---|---|---|---|---|---|
| | | | | **A1** | **A2** | **A3** |
| | | | | Normal to mildly increased | Moderately increased | Severely 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/1.73 m² Description and range | **G1** | Normal or high | ≥90 | | | |
| | **G2** | Mildly decreased | 60-89 | | | |
| | **G3a** | Mildly to moderately decreased | 45-59 | | | |
| | **G3b** | Moderately to severely decreased | 30-44 | | | |
| | **G4** | Severely decreased | 15-29 | | | |
| | **G5** | Kidney failure | <15 | | | |

Green: low risk (if no other markers of kidney disease, no CKD); Yellow: moderately increased risk; Orange: high risk;  Red, very high risk.  KDIGO 2012

Kidney Disease: Improving Global Outcomes (KDIGO) CKD Work Group. *Kidney Int Suppls.* 2013;3:1-150.

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# 80.3% of at-risk patients did not receive guideline concordant assessment (eGFR + uACR)

28,295,982 at-risk patients (16.2% diabetes/63.8 % hypertension/20.1% diabetes and hypertension)



| Diabetes & Hypertension | 41.4% |
| Hypertension | 10.5% |

**2018 Data**

**No data available**

Alfego, D., Ennis, J., Gillespie, B., Lewis, M. J., Montgomery, E., Ferre, S., Vassalotti, J., Letovsky, S. (2021). Chronic kidney disease testing among at-risk adults in the U.S. remains low: Real-world evidence from a national laboratory database. *Diabetes Care*.

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# Quality Measurement:
# Kidney Health Evaluation in Patients with Diabetes

## Kidney Health Evaluation for Patients With Diabetes - Total

| Year | Commercial HMO | Commercial PPO | Medicaid HMO | Medicare HMO | Medicare PPO |
|------|----------------|----------------|--------------|--------------|--------------|
| 2022 | 45.8 | 40.1 | 34.5 | 47.5 | 42.9 |
| 2021 | 43.9 | 39.6 | 33.5 | 44.2 | 40.3 |

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# Perception about CKD diagnosis

"I'm doing everything required to slow or stop CKD progression in managing risk factors for CKD. No 'need' to apply another chronic disease diagnosis to the medical record."

**Reality: CKD Diagnosis improves quality of care.**
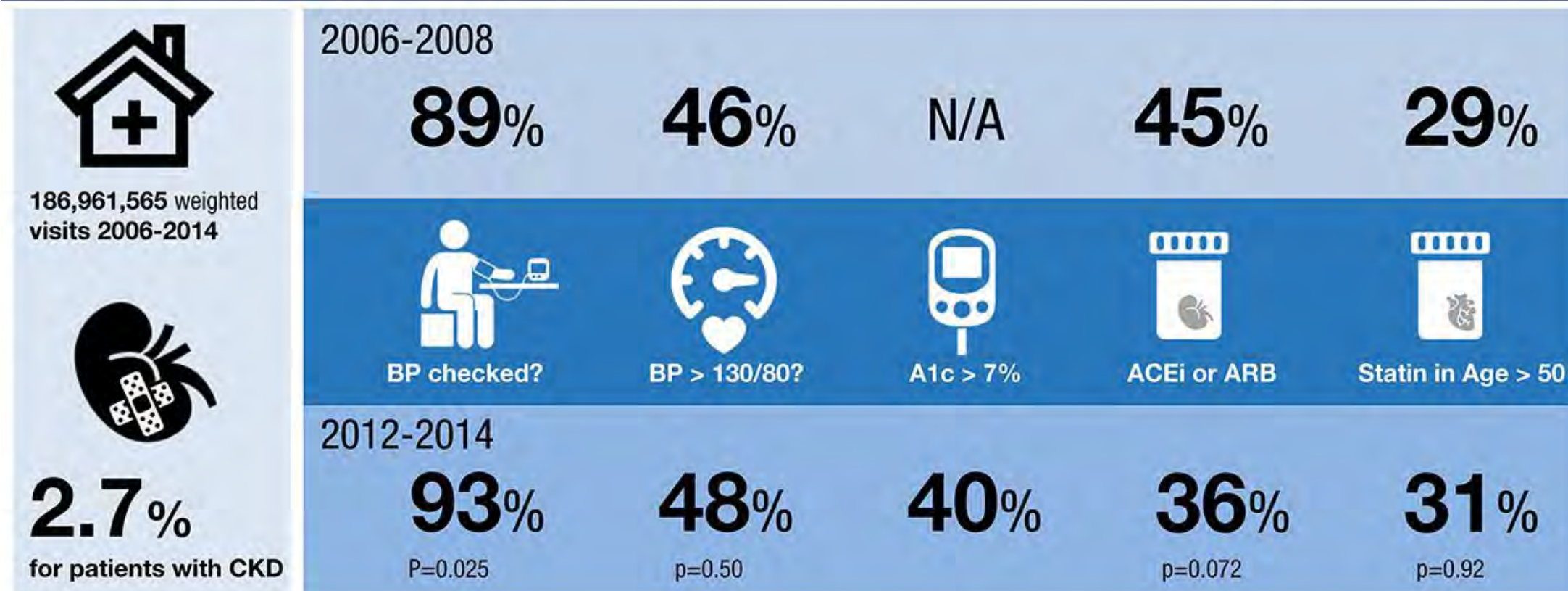
| Care improved with CKD recognition in the EHR problem list |
| --- |
| Increased Nephrology office visits |
| Increased ACE/ARB and Statin Rx |
| Increase measurement of CKD labs (proteinuria, phosphorus, iPTH and Vitamin D) |

Jolly et al. American Journal of Nephrology. 2014

# So how's CKD care in America?



CJASN
Clinical Journal of American Society of Nephrology

**186,961,565 weighted visits 2006-2014**

**2.7%** for patients with CKD

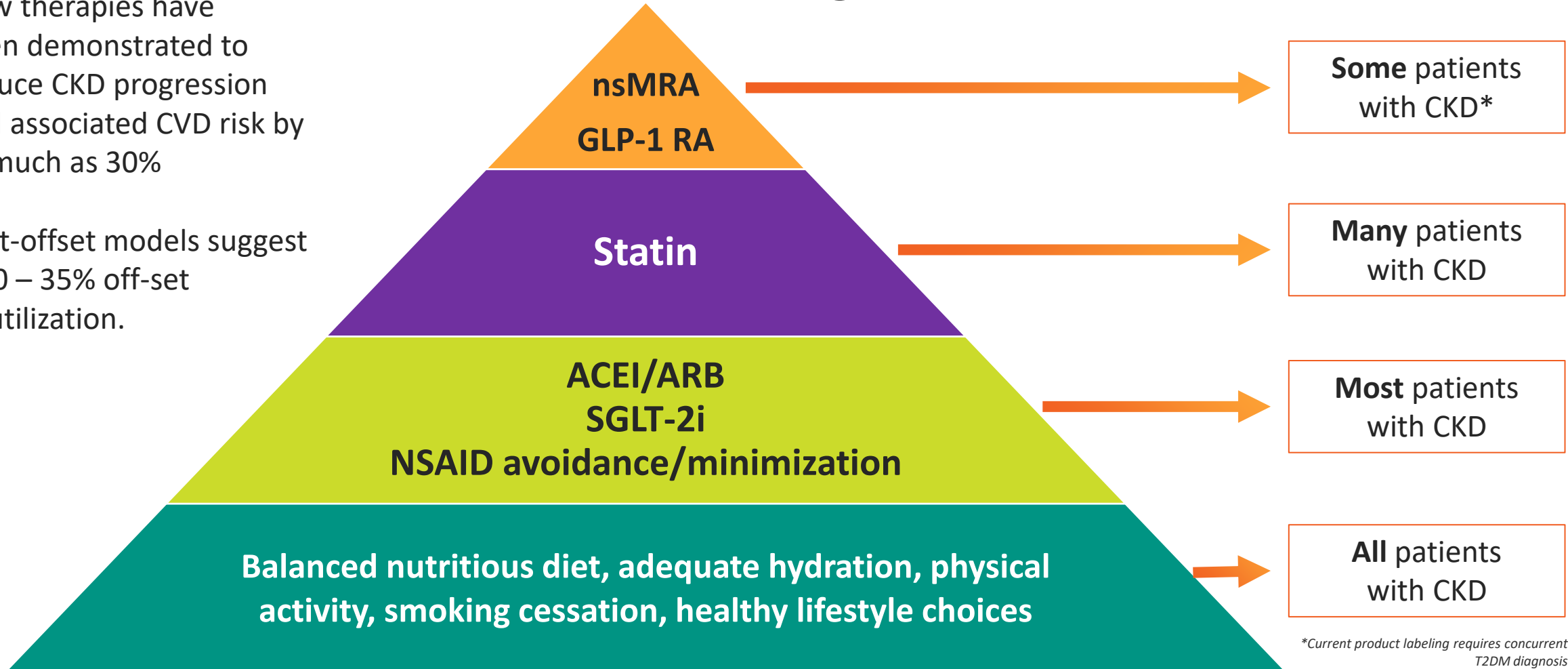| | BP checked? | BP > 130/80? | A1c > 7% | ACEi or ARB | Statin in Age > 50 |
|---|---|---|---|---|---|
| **2006-2008** | 89% | 46% | N/A | 45% | 29% |
| **2012-2014** | 93% | 48% | 40% | 36% | 2.31% |
| | P=0.025 | p=0.50 | | p=0.072 | p=0.92 |

**Conclusions** Patients with diagnosed CKD had a high prevalence of uncontrolled hypertension and diabetes. ACE and ARB use decreased and statin use was low and did not improve over time.

Sri Lekha Tummalapalli, Neil Powe, and Salomeh Keyhani. **Trends in Quality of Care for Patients with CKD in the United States.** CJASN doi: 10.2215/CJN.00060119. **Visual Abstract by Joel Topf, MD, FACP**

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# Interventions for Slowing CKD Progression and Reducing CV Risk

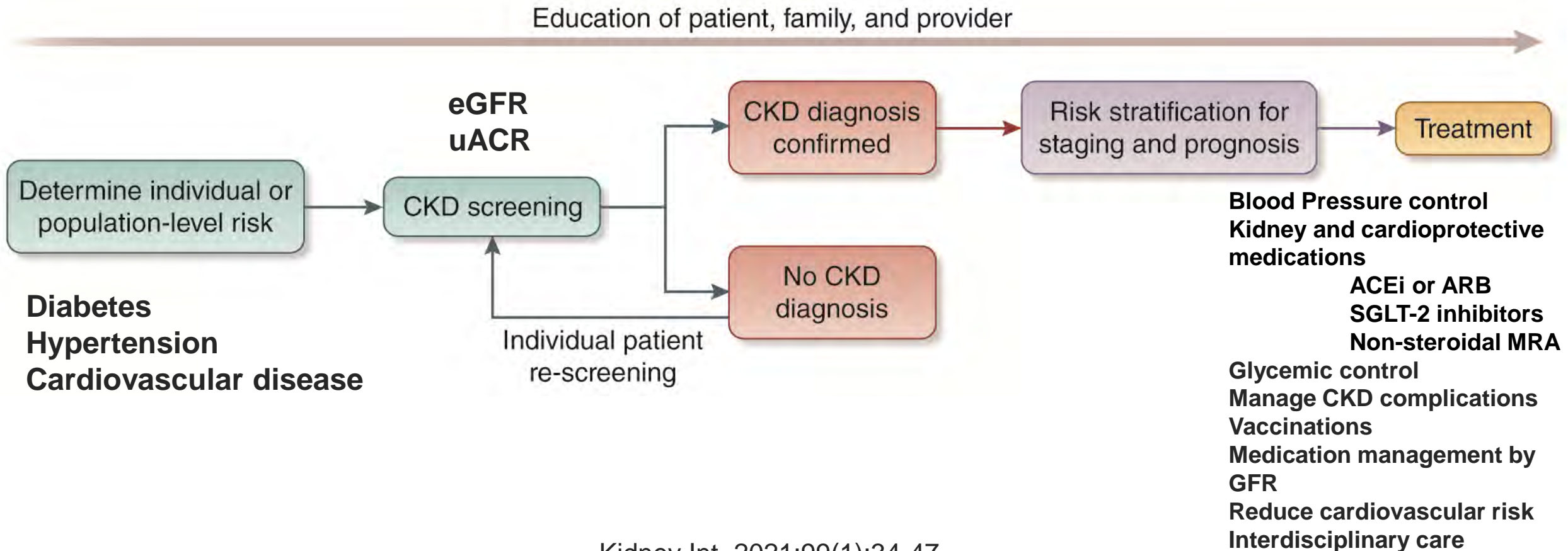New therapies have been demonstrated to reduce CKD progression and associated CVD risk by as much as 30%

Cost-offset models suggest a 30 – 35% off-set of utilization.

**nsMRA**
**GLP-1 RA** → **Some** patients with CKD*

**Statin** → **Many** patients with CKD

**ACEI/ARB**
**SGLT-2i**
**NSAID avoidance/minimization** → **Most** patients with CKD

**Balanced nutritious diet, adequate hydration, physical activity, smoking cessation, healthy lifestyle choices** → **All** patients with CKD

*Current product labeling requires concurrent T2DM diagnosis

- de Boer IH, et al. *Kidney Int*. 2022;102(5):974-989.
- KDIGO. *Kidney Int Suppl*. 2013;3:1-150.
- KDOQI. *Am J Kidney Dis*. 2015;65(3):354-366.
- National Kidney Foundation. CKD care algorithm, updated March 2023.

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nsMRA: non-steroidal mineralocorticoid receptor antagonist
GLP-1 RA: glucagon-like peptide 1 receptor agonist
SGLT-2i: sodium-glucose cotransporter-2 inhibitor
ACEI: angiotensin converting enzyme inhibitor
ARB: angiotensin receptor blocker
NSAID: nonsteroidal anti-inflammatory drug

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# Evaluating Risk of CKD Progression Concept Flow Map



Education of patient, family, and provider

**eGFR**
**uACR**

Determine individual or population-level risk → CKD screening

CKD diagnosis confirmed

No CKD diagnosis

Individual patient re-screening

Risk stratification for staging and prognosis → Treatment

**Diabetes**
**Hypertension**
**Cardiovascular disease**

**Blood Pressure control**
**Kidney and cardioprotective medications**
    **ACEi or ARB**
    **SGLT-2 inhibitors**
    **Non-steroidal MRA**
**Glycemic control**
**Manage CKD complications**
**Vaccinations**
**Medication management by GFR**
**Reduce cardiovascular risk**
**Interdisciplinary care**

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# Population Health for CKD and Diabetes: Lessons from the Indian Health Service

"The 54% reduction in incidence occurred in this population during a 20-year period despite per capita health expenditures equaling only ~40% of that spent in the US civilian population. Although one might expect such a dramatic decrease in disease in this high-risk disadvantaged population to be associated with novel and costly new therapies, the medical interventions implemented by the IHS were routine … However, a systematic population-based approach was instituted to implement this evidence-based care."

# Measures for CKD Care included in IHS Diabetes Care & Outcomes Audit Intervention

| Measure | Baseline | Impact |
|---|---|---|
| Improve average Hemoglobin A1C among people with DM | 10% | 8.1% |
| Continue blood pressure control among people with DM and CKD | 133/76 mmHg | 133/76 mmHg |
| Increase Urine Albumin-Creatinine Ratio Testing for early detection | 50% | 62% |
| Increase use of Ace Inhibitors (ACE) and Angiotensin Receptor Blockers (ARB) | 42% | 73% |

Intensive focus on mitigating health-related social needs and lifestyle impacts included in this intervention

Narva A. Population Health for CKD and Diabetes: Lessons From the Indian Health Service. *American Journal of Kidney Diseases*. 2018;71(3):407-411.

CKD Quality Improvement Intervention With PCMH Integration: Health Plan Results

This scalable CKD quality improvement study evaluated a population health intervention based on CKD risk stratification and demonstrated feasibility, decreased hospitalization, and corresponding selected reduced costs.
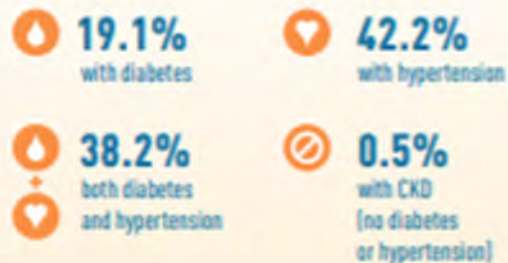
QUALITY IMPROVEMENT STUDY WITH PRE- AND POSTINTERVENTION ASSESSMENT, 7/1/15-6/30/17

**Population**

7420 PCMH outpatients with continuous CareFirst enrollment

Risk Factors

19.1% with diabetes
42.2% with hypertension
38.2% both diabetes and hypertension
0.5% with CKD (no diabetes or hypertension)

**Intervention**

CKD heat map risk stratification by eGFR and uACR
informs NKF-guided intervention

Nephrology services
by heat map class, pre- vs post

3 | 39% vs 34%
4 | 72% vs 62%
5 | 63% vs 83%
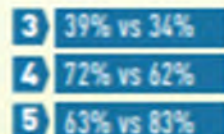
Mean visits in class 5, pre- vs post: 4.4 vs 12.4

**Results**

Hospitalizations
per 1000 members by heat map class, pre- vs post

3 | 362.5 vs 249.0
4 | 311.7 vs 219.2
5 | 590.9 vs 323.5
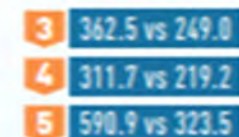
Per-member per-month expenditures
by heat map class, pre- vs post

3 | $ 276 savings
4 | $ 267 loss
5 | $ 480 savings
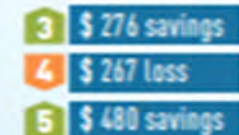
CKD indicates chronic kidney disease; eGFR, estimated glomerular filtration rate; NKF, National Kidney Foundation; PCMH, patient-centered medical home; uACR, urine albumin creatinine ratio. Limitations include incomplete urinary testing, quality improvement design not powered to precisely quantify expenditures, and generalizability may be limited to PCMH models.

Vassalotti JA, DeVinney R, Lukasik S, et al. CKD quality improvement intervention with PCMH integration: health plan results. Am J Manag Care. 2019;25(11):XXX-XXX.

AJMC Managed Markets Network

NATIONAL KIDNEY FOUNDATION       Vassalotti JA, DeVinney R, Lukasik S, et al. CKD Quality Improvement Intervention with PCMH Integration:  Health Plan Results. American Journal of Managed Care 2019

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# CKD Change Package

## Stages of CKD Change

The dashboard encompasses six Stages of Change for successful CKD care transformation, and each Stage provides actionable Change Ideas supported by evidence-based, guideline-driven Tools and Resources for care improvement activities.

### 1. Understand CKD and its Management in Primary Care

Review guideline testing and management for CKD and the consequences of unrecognized CKD as a disease multiplier.

Explore Stage of Change 1

### 2. Assess the Quality of CKD Care in Your Institution

Evaluate the effectiveness of your institution's CKD recognition and management.

Explore Stage of Change 2

### 3. Building the Business Case to Improve CKD Care

Demonstrate a strong case for change through a health equity lens and healthcare expenditures.

Explore Stage of Change 3

### 4. Convene a Multi-disciplinary Team

Gather input and participation from your institution's healthcare professionals who are ready for change.

Explore Stage of Change 4

### 5. Develop the Implementation Plan for Your CKD Intervention

Build a plan that aligns with practice or clinic workflows, patient panels, and available resources.

Explore Stage of Change 5

### 6. Execute and Measure Your Impact

Measure your CKD intervention to adjust as needed and help insure it achieves the desired outcomes.

Explore Stage of Change 6

https://www.kidney.org/professionals/ckd-intercept/ckd-change-package

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# CKD Data Strategy

- Serum creatinine with eGFR is included in basic and comprehensive metabolic panels

- 80% of people with undiagnosed CKD have serum creatinine with eGFR in their medical record already.

- Identify any patients with eGFR <60

- Test anyone with diabetes and/or hypertension that have not been tested in prior 12 months.



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A framework for

### CKD Claims Data Analysis

**Assess CKD Diagnosis**

Determine the percentage of adults (age 18 – 85) whose records reflect an ICD10 code for chronic kidney disease:

| CKD Stage | ICD-10 Codes |
|---|---|
| Stage 1 | N18.1 |
| Stage 2 | N18.2 |
| Stage 3 | N18.3 |
| Stage 4 | N18.4 |
| Stage 5 | N18.5 |
| CKD unspecified | N18.9 |

*At minimum, 10% of the adult population should have a diagnosis of CKD.*

**Assess Albuminuria Testing in At-Risk Populations**

Determine the percentage of patients with diabetes and/or hypertension (see ICD10 codes below) that have received an annual assessment for albuminuria (CPT 82043 and CPT 82570).

United States Renal Data System (USRDS) data suggest that:
   Less than 50% of people with diabetes are routinely tested for albuminuria each year.
   Only 10% of people with hypertension are tested annually for albuminuria.

**Diabetes ICD10 Codes:**
ICD-10-CM: E10.10, E10.11, E10.21, E10.22, E10.29, E10.311, E10.319, E10.321, E10.329, E10.331, E10.339, E10.341, E10.349, E10.351, E10.359, E10.36, E10.39, E10.40, E10.41, E10.42, E10.43, E10.44, E10.49, E10.51, E10.52, E10.59, E10.610, E10.618, E10.620, E10.621, E10.622, E10.628, E10.630, E10.638, E10.641, E10.649, E10.65, E10.69, E10.8, E10.9, E11.00, E11.01, E11.21, E11.22, E11.29, E11.311, E11.319, E11.321, E11.329, E11.331, E11.339, E11.341, E11.349, E11.351, E11.359, E11.36, E11.39, E11.40, E11.41, E11.42, E11.43, E11.44, E11.49, E11.51, E11.52, E11.59, E11.610, E11.618, E11.620, E11.621, E11.622, E11.628, E11.630, E11.638, E11.641, E11.649, E11.65, E11.69, E11.8, E11.9, O24.011, O24.012, O24.013, O24.019, O24.02, O24.03, O24.111, O24.112, O24.113, O24.119, O24.12, O24.13
Excluding:  O24.319, O24.32, O24.911, O24.912, O24.913, O24.92, and O24.93

**Hypertension ICD10 Codes**
I10, I12, I13

**CKD Data Strategy Success Story**

- Using EMR data, the practice team identified **2,134 patients with diabetes who had an eGFR <55, but no uACR or CKD diagnosis**. (July 2022)
  - Further stratified to identify **744 with an eGFR <45, but no CKD dx.**

- Implemented a EHR reminder system for providers for those patients with upcoming visits and eGFR <45. Total 121 patients (August 2022)

- 66 of 121 patients received a CKD diagnosis → **55% increase in CKD testing and dx among patients with diabetes** <u>within 1 month of implementation</u>

- **Ongoing efforts to bring in remaining 600+ patients for CKD testing and dx, adding additional CDS tools for providers, and screening patients with eGFR 45-60.**

- Implementing annual CKD testing for people with diabetes and/or hypertension.

- Adding CKD group education classes, CKD patient education videos to website and additional CME for clinicians on CKD.
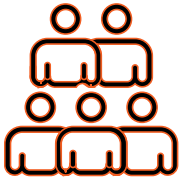
# CKD Learning Collaborative

**Program Description**

Learning Collaboratives are quality improvement initiatives in which clinical staff work together to redesign their systems to become more patient-focused and efficient.

- Develop data strategies utilizing medical record data to identify individuals with laboratory evidence of CKD
- Develop and implement clinical decision support is developed to ensure routine testing of people at-risk for CKD
- Establish care coordination models are established to recruit patients for CKD and risk stratify the severity of CKD.
- Provide primary care focused CKD education

Through individual clinic meetings and peer to peer engagement provide education and implement clinical decision support and workflow changes.

**NKF is recruiting for CKD Learning Collaborative participants in Minnesota. If you are interested in learning how your organization might participate contact Claire.johnson@kidney.org**

| Population Characteristic | Baseline: 1/22 – 12/22 | Program Start-Up: 1/2023-4/2023 | Intervention Period: 5/2023-12/2023 | Total % change |
|---|---|---|---|---|
| % patients (>17 yo) w/DM &/or HTN w/eGFR & uACR | 11.3% | 13.0% | *18.3%* | 62.8% |
| % patients (> 50 yo) w/DM &/or HTN w/eGFR & uACR | 28.4% | 30.2% | *37%* | 30.3% |
| % patients (>50 yo) w/ eGFR & uACR | 4.1% | 5.4% | 9.6% | 132.7% |
| % patients (> 50 yo) with eGFR <60 screened, diagnosed, and accurately staged | 25.9% | 30.7% | *41.6%* | 60.6% |
| % patients w/ lab evidence no CKD Dx | 67.4% | 67.7% | *50.2%* | -25.5% |
| % patients w/CKD Dx without ACR assessment | 64.2% | 51.6% | *42.8%* | -33.3% |
| % patients with CKD Dx | 8.2% | 9.0% | *13.1%* | 60.3% |
| **Medications** | | | | |
| Use of ACE w/CKD Diagnosis | 33.1% | 42.5% | 35.1% | 5.9% |
| Use of ARB w/CKD Diagnosis | 14.8% | 19.9% | *28.1%* | 89.9% |
| Use of Statins w/CKD Diagnosis | 50.6% | 59.1% | *65.0%* | 28.5% |
| Use of SGLT2i, MRA, and GLP1 w/CKD Diagnosis | 0.9% | 1.6% | 2.8% | 219.9% |

*Statistically significant at 95% confidence interval*

The NKF's 2-sided, patient flyers help summarize densely packed educational information found in various web pages, brochures and other NKF deliverables. Provided as downloadable, printable PDF's, the flyers can be offered as take-home resources for patients and/or included in electronic medical records.
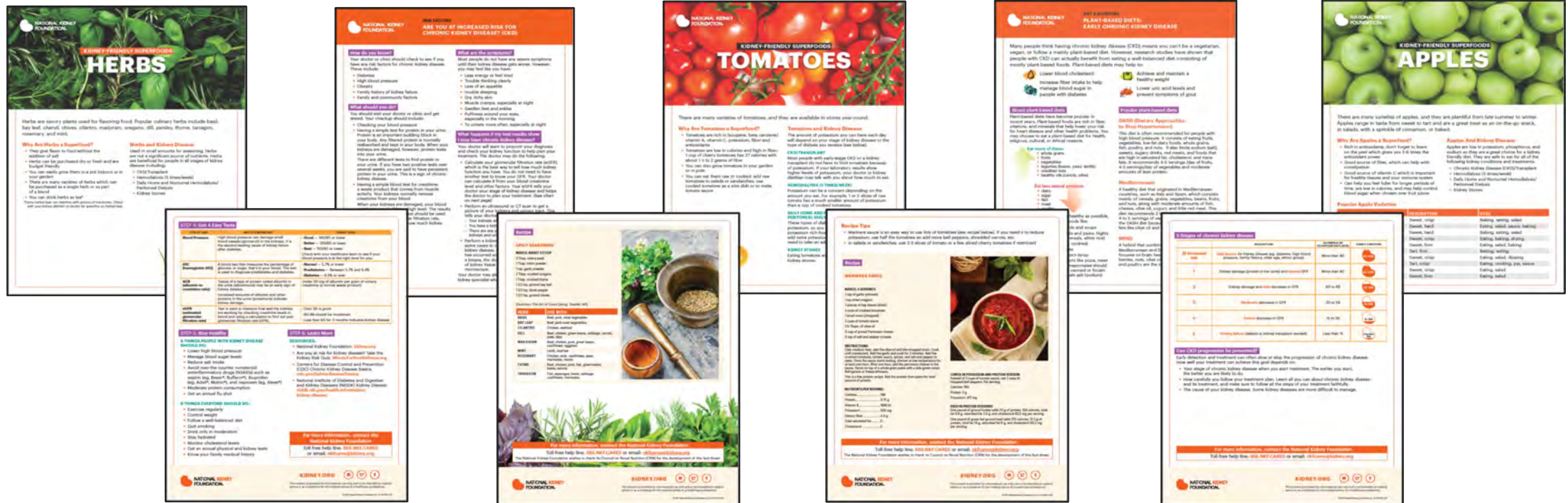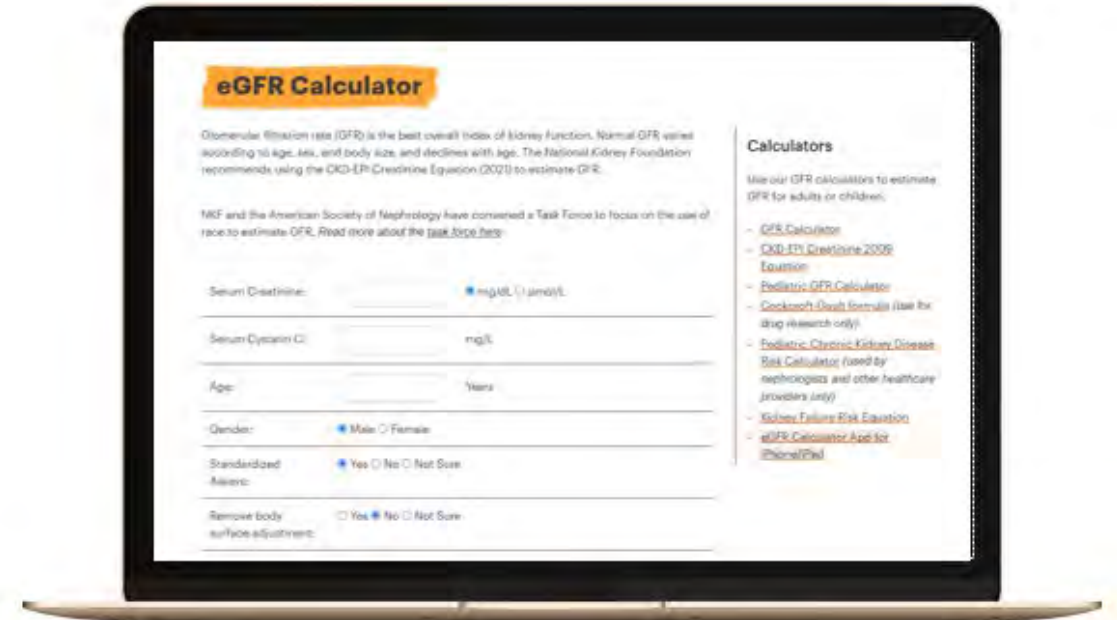


All flyers can be made available in English and Spanish and provide specific instruction on where the learner can go for additional information on the subject.

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# eGFR Calculators



https://www.kidney.org/apps/professionals/egfr-calculator
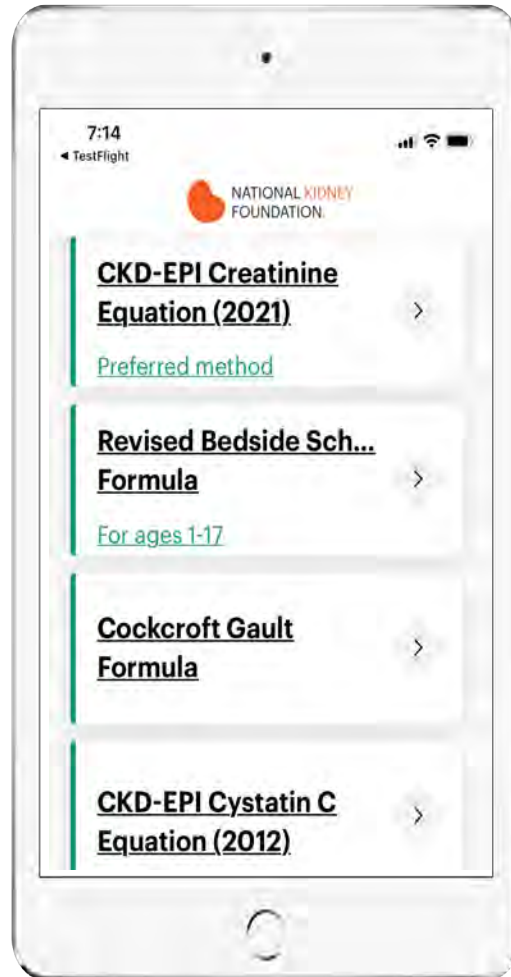
https://www.kidney.org/professionals/kdoqi/gfr_calculator

### What is it?

Data analysis tool created to support medical groups and clinics onboarded into PIPE system for tracking and assessing improvement efforts related to CKD prevention and treatment among patients with diabetes. There is no cost for participating in the dashboard project.

### Will this information be publicly reported?

No, this information will only be made available to participating medical groups and is intended to be used as a quality improvement tool.

### What kinds of analysis are included in the dashboard?

Performance by medical group/clinic, performance by medical group/clinic by demographic variables (e.g., age group, race/ethnicity, sex, country of origin, etc.), and peer comparison (at medical group level).

**Metrics Included:**

- HbA1c Management
- BP Management
- CKD Screening
- Rx for ACE/ARB
- Rx for SGLT-2 Inhibitors
- Rx for Non-Steroidal MRA
- Follow-up eGFR
- Follow-up UACR
- Missing Diagnosis of CKD after Abnormal Labs

For more information on enrollment, timing, and more, visit:

https://mncm.org/mncm-services/#collaboration-and-innovation

**or**

Contact Jess Donovan: donovan@mncm.org

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# Questions?

# Thank you!

## For more information:

Claire.johnson@kidney.org