A patient-centered, population health approach to older adults with CKD

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• Chronic kidney disease (CKD) is a complex chronic disease

• Prevalence increasing among older adults

• Associated with adverse health outcomes

• A **population health management** framework for older adults with CKD may be helpful

Coresh et al. JAMA. 2007
Population health - the health outcomes of a group of individuals, including the distribution of such outcomes within the group\(^1\)

Population health management – An approach to improving the health outcomes of a group of individuals

- Information (data) on group used to improve outcomes of patients within that group\(^2\)
- Prospective or anticipatory care\(^3\)
- Patient centered – focus on outcomes that are important to patient and their families

Population Health Management Framework

- Define population
- Identify care gaps
- Stratify risks
- Engage patients
- Manage Care
- Measure outcomes

Define population

Measure outcomes

Define population

Automated and Ongoing
- Data integration
- Analysis
- Reporting
- Communications

Identify care gaps

Engage patients

Stratify risks

Data collection, storage and processing

Manage Care

Interdisciplinary Team-based interventions

Patient-centered, individualized and contextualized and supports self-management

Risk of getting sick or sicker (anticipate common problems)
Prediction and multivariable models

Geriatrics focuses on multiple chronic conditions, frailty and geriatric syndromes.

Geriatrics emphasizes outcomes that are important to patients and their families.

Geriatrics is interdisciplinary and has developed many models of care (ACE units, GRACE, PACE, Care Transition Intervention, HBPC, HELP).

Geriatrics is patient- and family-centered (identifying patient preferences, health goals, geriatric assessment provides context, assess life-expectancy, address need for palliative care).

Geriatric assessments improve risk stratification (gait speed, frailty, cognition, function).

Geriatrics can identify gaps related to poor care coordination, complex transitions, rehospitalizations.

Risk of getting sick or sicker (anticipate common problems)
Prediction and multivariable models.

Interdisciplinary Team-based interventions

Automated and Ongoing
- Data integration
- Analysis
- Reporting
- Communications

Data collection, storage and processing

Analytics and Reporting, Validated outcomes that are routinely collected

Geriatrics is patient- and family-centered (identifying patient preferences, health goals, geriatric assessment provides context, assess life-expectancy, address need for palliative care).
Our research program in CKD and population health management

Validation of CKD in Medicare claims (Muntner et al. AJKD 2014)
Validation of NH in ESRD (Bowling et al. BMC Nephrology 2015)
CKD prevalence among oldest old (Bowling et al. JAMA 2013)
Albuminuria prevalence (Bowling et al. AJMS 2013)
CKD and nondisease-specific problems (Bowling et al. CJASN 2014)
Incident CKD & Multimorbidity (under review)
CKD life-expectancy (Bowling et al. JAGS 2015)
CKD and life-space delcine (Bowling et al. AJKD 2014)
CKD and ADLS decline (Bowling et al. JGMS 2011)
CKD complications by age (Bowling et al. CJASN 2011)

Measure outcomes
Define population
Identify care gaps
Stratify risks
Engage patients
Manage Care

Barriers to CKD self-management (Bowling et al. under review)
CKD and falls (Bowling et al. CJASN. 2016)
Can geriatric conditions be used to better stratify risks?

- Biomarkers used to stratify risk in CKD
- Geriatric conditions (falls, mobility impairment, cognitive impairment) are strong predictors of adverse health outcomes
- QUESTION: For VA patients 70 years and older with CKD, can geriatric conditions be used to predict risk for hospitalization and ED visits?
**Data access**

- VA has a large corporate data warehouse (CDW)
  - 1.5 petabytes of storage
  - 20 million unique patients
  - 1,000 separate data tables
  - 20,000 columns
  - 80 billion rows

- VA Informatics and Computing Infrastructure (VINCI)

- **PROBLEM:** Geriatric conditions not routinely captured in these data or only in text fields
Clinical reminder in the VA Renal Clinic

- Unstructured data in clinical notes → structured data variables in CDW
Data processing

- Microsoft SQL Server Management Studio 2014
- SAS Enterprise Guide 6.1
- R x64 3.1.2
VA Renal Clinic patients ≥ 70 years old (n = 201)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>% or median (range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>76 (70 – 95)</td>
</tr>
<tr>
<td>Male</td>
<td>99%</td>
</tr>
<tr>
<td>African American</td>
<td>46%</td>
</tr>
<tr>
<td>Hypertension</td>
<td>98%</td>
</tr>
<tr>
<td>Diabetes</td>
<td>64%</td>
</tr>
<tr>
<td>Heart failure</td>
<td>30%</td>
</tr>
<tr>
<td>eGFR (ml/min/1.73 m²)</td>
<td></td>
</tr>
<tr>
<td>≥ 60</td>
<td>3%</td>
</tr>
<tr>
<td>45 – 59</td>
<td>24%</td>
</tr>
<tr>
<td>30 – 44</td>
<td>41%</td>
</tr>
<tr>
<td>&lt; 30</td>
<td>32%</td>
</tr>
<tr>
<td>ACR, mg/g</td>
<td></td>
</tr>
<tr>
<td>&lt; 30</td>
<td>40%</td>
</tr>
<tr>
<td>30 – 299</td>
<td>38%</td>
</tr>
<tr>
<td>≥ 300</td>
<td>22%</td>
</tr>
</tbody>
</table>

Unrecognized geriatric conditions are common

42% of patients have 2 or more geriatric conditions

eGFR = estimated glomerular filtration rate, ACR = albumin-to-creatinine ratio
Stratify risks

Higher hospitalization at higher number of geriatric conditions

Number of geriatric conditions

Percentage of patients

0 1 2 or more

6% 20% 25%

Higher ED utilization at higher number of geriatric conditions

Number of geriatric conditions

Percentage of patients

0 1 2 or more

15% 31% 41%
Stratify risks

Classification and regression tree (CART) approach

- Split sample approach
- Training sample – 17 hospitalizations
- **Mobility impairment** most important characteristic for stratifying risk for hospitalization
- Validation sample low misclassification rate = 0.16
Conclusions

• Population health framework helpful for conceptualizing research and clinical programs for older adults with CKD

• Access to geriatric assessments may **improve risk stratification** in this population

• Next steps include engaging patients and managing care