



# Primary Medical Care Integrated with Healthy Eating and Healthy Moving is Essential to Reduce Chronic Kidney Disease Progression

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## ABSTRACT

Increasing adverse outcomes in patients with chronic kidney disease reflect growth of patients with early-stage chronic kidney disease and their increasing per population rates of these outcomes. Progression of chronic kidney disease, more than current level of kidney function, is the primary driver of adverse chronic kidney disease-related outcomes. Racial/ethnic minorities progress faster to end-stage kidney disease with greater risk for adverse outcomes. Diabetes and hypertension cause two-thirds of end-stage kidney disease, for which primary medical care integrated with healthy eating and increased physical activity (healthy moving) slows chronic kidney disease progression. Patients with early-stage chronic kidney disease are appropriately managed by primary care practices but most lack infrastructure to facilitate this integration that reduces adverse chronic kidney disease-related outcomes. Individuals of low socioeconomic status are at greater chronic kidney disease risk, and flexible regulatory options in Medicaid can fund infrastructure to facilitate healthy eating and healthy moving integration with primary medical care. This integration promises to reduce chronic kidney disease-related adverse outcomes, disproportionately in racial/ethnic minorities, and thereby reduce chronic kidney disease-related health disparities.

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**KEYWORDS:** Cardiovascular disease; Diabetes; Health inequities; Hypertension, Medicaid

**Funding:** None.

**Conflicts of Interest:** DEW, VM, NT, and DAB were paid consultants to Tricida, Inc. in connection with the development of this manuscript. DEW, VM, NT, and DAB are members of the Tricida Scientific and Clinical Advisory Board, and report consultancy and personal fees from Tricida, Inc. DEW was the lead investigator for the phase 3 study of veverimer (TRCA-301/301E) sponsored by Tricida. NT is the lead investigator and chairperson of the Steering Committee for the VALOR-CKD study sponsored by Tricida. DEW and VM are members of the Steering Committee for the ongoing VALOR-CKD study sponsored by Tricida. DAB was the lead investigator for the phase 1/2 study of veverimer (TRCA-101) sponsored by Tricida and is on the advisory board for the ongoing VALOR-CKD study sponsored by Tricida. VM is listed on patents related to work for Tricida. VM, NT and DAB report stock or stock options in Tricida. NT reports additional consulting fees and grants from

from Astra Zeneca Inc, Otsuka Inc, Janssen, Boehringer Ingelheim/Eli Lilly, Bayer, Renibus and is the founder of Clinpredict and Klinrisk Inc. VM reports additional consulting fees from Tricida, Equillum, Myovant, Rigel, Corvidia, Acuta, Frazier, Intarcia, PTC Bio, Galderma, Escient, and Sanifit outside the submitted work. DAB also reports consulting fees from Amgen, Fresenius/Relypsa/Vifor, personal fees as a medical advisory board member from Sanifit, and past stock ownership in Relypsa, all outside this work. DAB reports grant support from the National Institutes of Health and Renal Research Institute, both outside this work.

**Authorship:** All authors had roles in manuscript preparation and access to its data

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## INTRODUCTION

Chronic kidney disease is among the few chronic diseases in the United States with increasing prevalence,<sup>1</sup> is the ninth leading cause of US mortality,<sup>2</sup> and is increasing disability-adjusted life years lost.<sup>1,3</sup> Patients with chronic kidney disease contribute broadly to US mortality because they have increased risks for heart disease,<sup>4</sup> cancer for those over age 65 years,<sup>5</sup> and stroke,<sup>6</sup> which represent, respectively, the first, second, and fifth causes of US mortality.<sup>2</sup> Because patients with chronic kidney disease more likely die from these diseases prior to progressing to end-stage kidney disease,<sup>7</sup> their deaths *from* these non-chronic kidney diseases but *with* underlying chronic kidney disease are not counted as chronic kidney disease-related mortality, making it an under-appreciated cause of US mortality.

### Chronic Kidney Disease Stage and Outcomes

Increasing chronic kidney disease stage reflects decreasing estimated glomerular filtration rate,<sup>4</sup> and each subsequent stage is associated with increased mortality.<sup>8,9</sup> Even patients with the comparatively preserved estimated glomerular filtration rate of stage 2 (60-89 mL/min/1.73 m<sup>2</sup>) suffer increased all-cause and cardiovascular disease mortality than those with normal estimated glomerular filtration rate.<sup>8,10</sup> Chronic kidney disease prevalence is increasing among Medicare patients aged 65 years and over, particularly those with stage 3 (estimated glomerular filtration rate 30-59 mL/min/1.73 m<sup>2</sup>),<sup>4</sup> the latter being the largest fraction of US patients with chronic kidney disease.<sup>4</sup> Also, chronic kidney disease-related mortality is increasing,<sup>4</sup> as is its progression to end-stage kidney disease,<sup>9</sup> making chronic kidney disease a major health burden.

### Chronic Kidney Disease Progression and Outcomes

Although current estimated glomerular filtration rate is an important determinant of adverse outcomes,<sup>8</sup> its more rapid progression is associated with greater end-stage kidney disease risk<sup>10</sup> and mortality<sup>11</sup> independent of current estimated glomerular filtration rate. Because progression from stage 3 to stage 4 (estimated glomerular filtration rate 15-29 mL/min/1.73 m<sup>2</sup>) yields the greatest proportional increase in mortality<sup>12</sup> and care costs<sup>13</sup> than other stage progressions, preventing stage 3 to 4 progression yields the greatest return with respect to minimizing mortality and management costs. Primary care guidelines<sup>14</sup> recommend nephrology

referral only when estimated glomerular filtration rate is <30 mL/min/1.73 m<sup>2</sup> (stages 4 and 5) or when urine albumin-to-creatinine ratio exceeds 300 mg/g creatinine<sup>15</sup> such that primary care practices manage patients with chronic kidney disease up to and including stage 3. Primary care practices are therefore key to preventing the most critical chronic kidney disease stage progression with its adverse human, medical, and economic outcomes.

## CLINICAL SIGNIFICANCE

- Progression of early-stage chronic kidney disease, managed in primary care, contributes most chronic kidney disease-related adverse outcomes.
- Racial/ethnic minorities suffer greater risk for chronic kidney disease progression.
- Healthy eating and increased physical activity (healthy moving) integration with primary *medical* care to yield primary *health* care can slow progression of chronic kidney disease.
- Flexible Medicaid options can fund infrastructure to support this integration that will facilitate this primary health care approach.

The 2 strongest independent predictors of chronic kidney disease progression for patients in a large health system were proteinuria and elevated systolic blood pressure,<sup>16</sup> both of which are easily identified and managed in primary care settings. Furthermore, patients with diabetes and stage 3 chronic kidney disease compared with earlier stages were more likely to have rapid estimated glomerular filtration rate decline, and the risk was greater for those with more proteinuria.<sup>16</sup> Unfortunately, most patients with diabetes or hypertension followed in primary care settings are unaware of their chronic kidney disease risk<sup>17</sup> and are not routinely assessed for estimated glomerular filtration

rate or albuminuria, particularly those insured by Medicaid or Medicare.<sup>18</sup> These data show the tremendous opportunity to improve identification of patients with diabetes or hypertension in primary care settings for interventions that will reduce their risk for these adverse outcomes.

### Socioeconomic/Racial/Ethnic Associations with Chronic Kidney Disease Prevalence and Outcomes

Individuals of low socioeconomic status are at increased chronic kidney disease risk<sup>4,19</sup> and are at increased risk for its 2 major causes, diabetes<sup>20</sup> and hypertension.<sup>21</sup> Comparing black and white individuals of the same socioeconomic status, higher diabetes prevalence in black individuals was mediated by differences in established socioeconomic status-related risk factors for diabetes such as obesity and lack of physical activity.<sup>22</sup> More consistent implementation of lifestyle modifications, including healthy eating and healthy moving, can improve outcomes in patients with diabetes-related chronic kidney disease.<sup>23</sup> The data highlight opportunities for Medicaid, the government health insurer for individuals with low incomes, to fund interventions shown to reduce the risk for chronic kidney disease and its progression in this population at higher risk for both.

US racial and ethnic minorities, compared with non-minorities, are more likely to be of low socioeconomic status, more likely to suffer untoward health effects associated

with low socioeconomic status,<sup>24</sup> and suffer the impact of chronic kidney disease disproportionately.<sup>4,25</sup> For example, black compared with white individuals have higher chronic kidney disease risk,<sup>4</sup> and once it is present, black individuals progress faster to end-stage kidney disease.<sup>25</sup> Black individuals also have higher risk for the 2 major causes of chronic kidney disease, diabetes<sup>26</sup> and hypertension.<sup>27</sup> Following onset of diabetes, a black individual is more likely to develop diabetes-related chronic kidney disease<sup>26</sup> and more likely than a white individual to die when each has the same estimated glomerular filtration rate.<sup>28</sup> Likewise, black individuals with hypertension develop early-stage chronic kidney disease at similar rates to other US population groups with hypertension, but progress faster to end-stage kidney disease,<sup>29</sup> with higher mortality.<sup>30</sup> Although black individuals have less medical care access than white individuals,<sup>24</sup> health care providers achieve higher performance on chronic kidney disease process measures among black than white individuals.<sup>31</sup> This suggests that successful implementation of process measures of medical care such as medication prescription and diagnostic testing are unlikely to fully explain racial/ethnic disparities in adverse chronic kidney disease outcomes. As described for diabetes,<sup>23</sup> more routine integration of healthy eating and healthy moving with process-driven medical care might reduce these adverse outcomes. Because black, compared with white, individuals are more likely to be of low socioeconomic status,<sup>32</sup> black individuals are more likely to have Medicaid support their health needs. Thus, Medicaid can finance innovative interventions like infrastructure to support integration of healthy eating and healthy moving within primary medical care to help reduce adverse chronic kidney disease-related outcomes.

### **GREATER CONTRIBUTIONS OF EARLY-STAGE CHRONIC KIDNEY DISEASE TO ADVERSE CHRONIC KIDNEY DISEASE OUTCOMES**

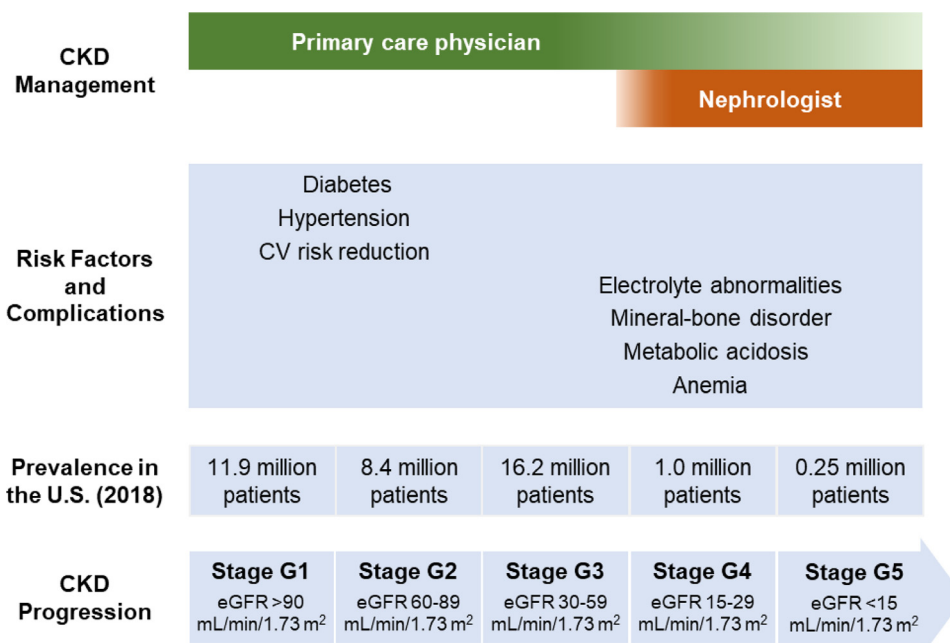
Increases in chronic kidney disease-related mortality and of disability-adjusted lives lost<sup>1,3</sup> are mediated in part by little progress in reducing these outcomes in patients with earlier-stage chronic kidney disease (stages 1-3, estimated glomerular filtration rate  $\geq 30$  mL/min/1.73 m<sup>2</sup>), who are increasing in incidence and in their per-population rate of adverse outcomes.<sup>3</sup> These suboptimal outcomes in patients with early-stage chronic kidney disease might be mediated in part by less-than-optimal implementation of lifestyle recommendations for treatment of diabetes and hypertension. Healthy eating, including high dietary proportions of fruits and vegetables, is recommended first-line diabetes treatment but is less than optimally implemented in most with diabetes.<sup>33</sup> Increased physical activity is also recommended first-line diabetes treatment, but it too is less-than-optimally implemented,<sup>34</sup> including in those with diabetes-related chronic kidney disease.<sup>23</sup> Similarly, healthy eating, including the Dietary Approaches to Stop Hypertension

diet, high in fruits and vegetables, is recommended first-line treatment for hypertension but is under-used in these patients.<sup>35</sup> Increased physical activity is recommended first-line treatment for hypertension but is under-used as well.<sup>36</sup>

### **HEALTHY EATING AND HEALTHY MOVING INTEGRATED WITH MEDICAL CARE MIGHT REDUCE CHRONIC KIDNEY DISEASE PROGRESSION**

Prevention of further kidney function decline best begins with management of early-stage chronic kidney disease, which is likely to be recognized first by primary care physicians (Figure 1). Glycemic control in patients with diabetes<sup>37</sup> and blood pressure control in those with hypertension without diabetes but with proteinuria<sup>38</sup> is associated with slower chronic kidney disease progression in its early stages, and such care is typically provided in primary care. Nevertheless, patients with modest estimated glomerular filtration rate reductions below normal ( $<90$  mL/min/1.73 m<sup>2</sup>) can have persistent progression toward end-stage kidney disease despite recommended kidney-protective interventions including blood pressure control, with regimens including anti-angiotensin II therapy in patients with chronic kidney disease due to diabetes<sup>39</sup> or to non-diabetic causes.<sup>40</sup> Persistent progression despite blood pressure control with anti-angiotensin II therapy is particularly prevalent in populations at increased end-stage kidney disease risk, including black individuals<sup>41</sup> in whom greater progression risk begins at early chronic kidney disease stages, including stages 1 and 2.<sup>42</sup> Also, diabetes-related chronic kidney disease progression continues in patients despite sodium-glucose cotransporter-2 inhibitors<sup>23</sup> and mineralocorticoid receptor antagonists.<sup>43</sup>

Effective lifestyle interventions integrated with pharmacologic therapy available to primary care might further reduce progression risk in early-stage chronic kidney disease (Figure 2). Epidemiologic studies support lower chronic kidney disease incidence<sup>44</sup> and its slower progression in patients eating “healthy” diets (including high amounts of fruits and vegetables).<sup>45</sup> Metabolic acidosis associated with enhanced chronic kidney disease progression<sup>46</sup> can be improved by dietary addition of fruits and vegetables,<sup>47</sup> and this adjunctive treatment in patients with chronic kidney disease on guideline-recommended pharmacologic kidney protection slowed estimated glomerular filtration rate decline.<sup>46</sup> Epidemiologic studies support lower chronic kidney disease incidence in general populations eating low sodium diets,<sup>48</sup> and in patients with chronic kidney disease, this intervention reduced blood pressure<sup>49</sup> and slowed progression.<sup>50</sup> Because increased dietary sodium attenuated the kidney-protective effects of angiotensin-converting enzyme inhibitors<sup>51</sup> and angiotensin receptor blockers,<sup>52</sup> dietary sodium restriction might also enhance kidney protective effects of angiotensin-converting enzyme inhibitors and angiotensin receptor blockers, both mainstream

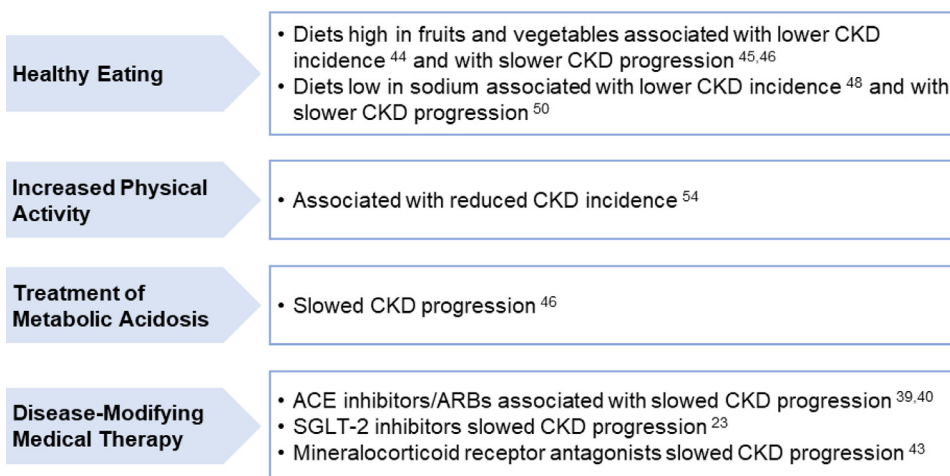


**Figure 1** Reframed paradigm for CKD management. The bulk of patients with CKD are in its early stages and are managed in primary care where the opportunity to prevent its progression to more advanced stages with its associated adverse outcomes is greatest. This care is best done by comprehensive management of the two major CKD causes, diabetes and hypertension, which includes integration of healthy eating and healthy moving with primary medical care. CKD = chronic kidney disease; CV = cardiovascular; eGFR = estimated glomerular filtration rate.

therapy for chronic kidney disease.<sup>53</sup> Increased physical activity is also associated with reduced chronic kidney disease incidence,<sup>54</sup> and interventional studies will determine if this intervention that improves glycemic<sup>33</sup> and blood pressure<sup>36</sup> control also reduces chronic kidney disease risk or its progression in patients with its 2 major causes, diabetes and hypertension.<sup>4</sup>

### A REFRAMED PARADIGM FOR EARLY-STAGE CHRONIC KIDNEY DISEASE CARE

Outcomes for patients with earlier-stage chronic kidney disease might improve with a reframed care paradigm that integrates healthy eating and healthy moving with standard primary medical care, as recommended for diabetes<sup>33</sup> and hypertension.<sup>35</sup> This paradigm recognizes that nearly all



**Figure 2** Interventions to slow or prevent CKD progression. ACE = angiotensin-converting enzyme; ARBs = angiotensin II receptor blockers; CKD = chronic kidney disease; SGLT-2 = sodium-glucose cotransporter-2.



components of chronic kidney disease guideline care for patients with early-stage chronic kidney disease<sup>53</sup> constitute elements of care that are already commonly addressed in primary care settings,<sup>14,15</sup> and is illustrated in Figure 1. This approach aligns with a new vision of “high quality primary care” that emphasizes integration of resources like healthy eating with medical care and recognizes the critical role of communities in provision of primary care.<sup>55</sup> Executing this paradigm in communities of low socioeconomic status, appropriate foci for strategies to reduce chronic kidney disease incidence,<sup>19</sup> requires investment in infrastructure to integrate healthy eating<sup>56</sup> and healthy moving<sup>57</sup> with primary medical care. This integration will help generate a shift from delivery of primary *medical* care toward a model facilitating primary *health* care and prevention with the goal of reducing or preventing adverse chronic kidney disease-related outcomes.

This shift to primary health care for chronic kidney disease requires new infrastructure to facilitate healthy eating and healthy moving programs, and would add resources to existing primary care delivery systems that currently largely support office-based medical care. New programs would go beyond typical office-based attempts to help patients achieve important health behavior changes, which often involve provider recommendations that patients seek options for healthy eating and healthy moving through programs that are often unconnected to their ongoing medical care. A more ideal scenario would provide infrastructure for healthy eating and healthy moving that is functionally connected with the medical infrastructure to provide the 3 components of primary health care (medical care + healthy eating + healthy moving) as a single enterprise. In low-income, largely racial/ethnic minority communities, this approach led to decentralized community-based platforms for healthy eating and healthy moving, including institutions of faith and community centers, each with low barriers to access. Healthy eating and healthy moving infrastructure consisted of “Farm Stands” at local community centers and churches along with structured physical activity programs at many of these locations. These platforms for healthy eating and healthy moving function collaboratively with centralized clinics that provide the medical component of primary health care, and community health workers help maintain functional connections among these infrastructure components.<sup>58</sup>

Infrastructure supporting healthy eating and healthy moving in communities of low socioeconomic status should be *in* these communities to lower barriers to access, given the challenges faced by residents of such communities to access health system services.<sup>59</sup> Optimizing usage of such resources in these communities with justifiable mistrust of health systems due to historical mistreatment requires affirmation by “trusted agent” community entities like faith-based institutions or local community centers.<sup>59,60</sup> Many “trusted agent” community-based organizations provide social and support services, including chronic disease self-management programs, nutrition counseling, and physical activity programs.<sup>61</sup>

## RECENT POLICIES SUPPORT INTEGRATION OF HEALTHY EATING AND HEALTHY MOVING INTO PRIMARY CARE FOR CHRONIC KIDNEY DISEASE

The Kidney Care Choices Model being assessed by the Center for Medicare and Medicaid Innovation (CMMI) focuses on chronic kidney disease stages 4 and 5, including those with end-stage kidney disease, and so is directed at nephrologists, not primary care providers. While important, these models do not allow for a more holistic approach to chronic kidney disease progression through primary care management of patients with earlier-stage disease in whom protective strategies can most impactfully reduce adverse outcomes. Accordingly, it seems prudent for CMMI to consider primary care practitioners in future incentives for forthcoming iterations of payment modeling to reduce chronic kidney disease-related adverse outcomes.

Given the disproportionately elevated risk for chronic kidney disease in low socioeconomic status communities and that Medicaid is the government insurer for individuals with low-incomes, Medicaid is an attractive program through which to support community-based, kidney-protective strategies inclusive of healthy eating and healthy moving integrated with primary medical care to achieve this new standard of primary health care. Medicaid programs are increasingly exercising regulatory options to address health needs that go beyond provision of traditional medical care through non-medical drivers of health care, including healthy eating and healthy moving.<sup>62</sup> This approach is particularly relevant, recognizing that medical care accounts for only about 10%-20% of modifiable contributors to healthy population outcomes.<sup>63</sup> While Medicaid traditionally does not cover non-medical service expenditures, many state programs are addressing these needs through managed care contracts and other authorities made available to them,<sup>64</sup> including use of alternative payment models.<sup>65</sup>

The Accountable Health Communities Model launched in 21 states by CMMI in 2017 examines Medicare and Medicaid beneficiaries to determine if identifying and addressing their health-related social needs, including through community navigation services, and connecting them with community-based resources, will improve health outcomes, reduce utilization of health care resources, and reduce health care costs.<sup>66</sup> The model funds multiple entities in the health care “value chain,” such as community service providers (including providers of healthy food), clinical delivery sites, and “bridge” organizations, including nonprofits that provide functional connections among contributing entities. This analysis identified food insecurity as the most reported health-related social need.<sup>66</sup> Home delivery of medically tailored meals to nutritionally vulnerable individuals reduced hospitalizations and lowered medical spending,<sup>67</sup> and modeling shows that increased healthier food consumption can lead to cost-effective health improvements.<sup>67</sup> In response, some states are using flexibility within Medicaid,<sup>62</sup> including managed care contracts

and other available authorities<sup>64</sup> to pay for home-delivered meals.<sup>67,68</sup> Leveraging support from Medicare and Medicaid, North Carolina built a statewide infrastructure, including incentives to address nonmedical drivers of health including nutrition, showing allowable Medicaid options that states can use to provide adjunctive services that support health like healthy eating.<sup>69</sup> These experiences reinforce the increasing recognition of the importance of healthy eating as a critical component of health care.<sup>70</sup> Medicaid has also provided grants to support incentives for participants to join programs for structured physical activity,<sup>71</sup> recognizing its benefits to reduce adverse outcomes in chronic disease, including in chronic kidney disease.<sup>72</sup>

Recognizing the value of community-based platforms that provide resources for evidenced-based lifestyle modifications like healthy eating, health systems have worked with community-based institutions that provide services such as nutrition and have shown that such collaborations can reduce health care costs and generate a return on investment.<sup>61</sup> Accordingly, during fiscal year 2021, 27 state Medicaid directors required their Managed Care Organizations to partner with community-based organizations or social-service providers to integrate their services with traditional medical care.<sup>73</sup> These examples show Medicaid's embrace of community-based platforms for delivery of non-medical care resources that, when integrated with medical care, provides this expanded vision of health care. Many health system/community entity collaborations include engaging cultural, faith-based, and community-based organizations.<sup>74</sup> Analysis in the Accountable Health Communities Model revealed that establishing trust was key for beneficiaries to accept the necessary navigation for accessing health-promoting resources.<sup>66</sup> Engaging with community-based organizations allows health systems to leverage the trust that these organizations have already established with communities, facilitating beneficial health outcomes.<sup>59,60</sup>

These health system/community collaborations indicate the importance of the community context in delivering care, particularly in low socioeconomic status communities.<sup>75</sup> Health system practices engaged in community collaborations are best able to achieve goals of the Patient Centered Medical Home through optimal use of lay staff who enable practices to achieve these goals, in part by helping free up providers to focus on tasks only they can perform.<sup>76</sup> This supports the benefits of health systems collaborating with community-based organizations to aid the transition from simply providing medical care to delivering health care.<sup>59</sup>

## CONCLUSIONS

Patients with early-stage chronic kidney disease incur most of the adverse outcomes from this chronic disease, and its progression contributes importantly to these outcomes. Comprehensive management of its 2 major causes—diabetes and hypertension—including integration of healthy eating and healthy moving with primary medical care to yield

primary health care, promises to reduce these adverse outcomes and to do so disproportionately in racial/ethnic minorities, thereby reducing chronic kidney disease-related health disparities. Recent policy initiatives will help this strategy by incentivizing identification of early-stage chronic kidney disease and incentivizing infrastructure support for healthy eating and healthy moving, especially in low-income communities at high risk for chronic kidney disease.

## ACKNOWLEDGMENTS

The authors acknowledge the guidance and contributions of Dr. Dawn Parsell and Dr. Jun Shao (both employees of Tricida, Inc.) in the development of this manuscript. The authors would like to thank Dr. Jun Shao for the design of the Figures and editorial support.

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