Integration of Care in Management of CKD in Resource-Limited Settings

Ikechi G. Okpechi, MD, PhD,* Aminu K. Bello, MD, PhD,†
Oluwatoyin I. Ameh, MD, MPhil,‡ and Charles R. Swanepoel, MD, FRCP*  

Summary: The prevalence of noncommunicable diseases, including chronic kidney disease (CKD), continues to increase worldwide, and mortality from noncommunicable diseases is projected to surpass communicable disease–related mortality in developing countries. Although the treatment of CKD is expensive, unaffordable, and unavailable in many developing countries, the current structure of the health care system in such countries is not set up to deliver comprehensive care for patients with chronic conditions, including CKD. The World Health Organization Innovative Care for Chronic Conditions framework could be leveraged to improve the care of CKD patients worldwide, especially in resource-limited countries where high cost, low infrastructure, limited workforce, and a dearth of effective health policies exist. Some developing countries already are using established health systems for communicable disease control to tackle noncommunicable diseases such as hypertension and diabetes, therefore existing systems could be leveraged to integrate CKD care. Decision makers in developing countries must realize that to improve outcomes for patients with CKD, important factors should be considered, including enhancing CKD prevention programs in their communities, managing the political environment through involvement of the political class, involving patients and their families in CKD care delivery, and effective use of health care personnel.  

Semin Nephrol 37:260-272 © 2017 Elsevier Inc. All rights reserved.

Keywords: CKD, chronic disease management, integrated care, health policy

Chronic kidney disease (CKD) is prevalent worldwide and increasingly is being recognized as an important public health issue with adverse clinical and economic consequences.1,2 Cost of CKD treatment and mortality continues to increase in several countries.3–6 Part of the problem is related to the health care approach adopted for the management of chronic conditions around the world. Although health systems in developed countries largely have adopted approaches suitable to manage chronic diseases, including CKD, the situation in low- to middle-income countries (LMICs) is very different.

Integrated care in the management of CKD represents an approach to get political leaders, policymakers, health care practitioners, patients, and the community together to ask important questions and provide practical solutions toward effective kidney care in their own setting. As health systems around the world continue to undergo innovation,7,8 including a movement away from the traditional acute care management process to one that uses integrated methods to provide chronic disease care, there is a need for buy-in into this approach in LMICs, which are likely to continue to experience an increasing burden of CKD in the coming years.9 This review discusses the concept, barriers, and application of integrated CKD care in LMICs. First, we define the concept of integrated care and link its taxonomy to management of CKD in LMICs. Second, we discuss the perceived barriers to effective CKD care, and, third, we recommend practical approaches to integration of CKD care in LMICs using the predefined World Health Organization (WHO) model of care for chronic disease management.10

MODELS OF CARE FOR CHRONIC DISEASES

In 2002, the WHO proposed the Innovative Care for Chronic Conditions (ICCC) as a new model of health systems to help manage the global increasing epidemic of chronic diseases, including both communicable and noncommunicable diseases (Fig. 1).10 The new model was based on the chronic care model, a framework for improving chronic illness care and for improving care at both the individual and population level.11 Knowledge that aspects of the chronic care model could not be applied worldwide, especially in developing countries, gave birth to the ICCC framework based on a set of precepts at 3 levels (Fig. 1).10,12

The micro level highlights partnership between families/patients, health care teams, and communities, and functions best when every member at this level is informed, motivated, and prepared with the skills...
necessary to manage chronic conditions. The meso level points to health care organization and community and highlights the need for increasing disease awareness, promoting continuity and coordination of care, and providing complementary services, and stresses the need to organize and equip the health care teams. The macro level: reflects on policy making and the financial aspects of an integrated approach and includes legislation, providing leadership and advocacy, partnerships, financing, allocation of human resources, and policy integration.

The building blocks of the ICCC framework are to be used by decision makers to create or redesign an existing health care system to expand their capacity to manage long-term health problems.13 Because of its complexity and associations with major health consequences, CKD is amenable to integrated approach management with a huge potential for impact. Such an integrated approach uses strategies to identify and prevent CKD in at-risk populations; to retard progression of disease; to initiate treatment for early disease, risk factors, and complications; to schedule referral of patients and their follow-up evaluation; to provide equipment to facilitate treatment of advanced disease (eg, dialysis and transplantation); to allow for storage and access of health information records; to include family and community involvement in care; and to manage payment and provision policies for CKD care to promote health and welfare and reduce disease burden and premature death (Fig. 2).12,14

An effective approach to CKD care requires that all levels of the framework (micro, meso, and macro levels) are necessary for good outcomes to be observed. In many LMICs, the care process stops with the use of a few aspects at the micro level, with no involvement of the meso and macro levels of care. Thus, even if a system has an informed, prepared, and motivated health care team (in many places only nephrologists) for CKD care (micro level), this will not be enough to improve care if there is no legislation, financing, or national policy for CKD care (macro level); if there are no channels for increasing CKD awareness; organizing and equipping the health teams; or encouraging quality through leadership and incentives (meso level). Effective solutions require comprehensive and integrated actions at the national level, led by governments, the private sector, and involving local nongovernmental organizations and key players at all levels of the health system.15 Perhaps for most LMICs, the critical process needed to improve CKD care begins with an acknowledgement by government that CKD is a problem, even if it is beyond their capacity to finance the care of CKD. This is likely to encourage other levels of care to become active to mobilize and coordinate available resources, seeking to strengthen partnerships, increasing awareness, and supporting self-management and disease prevention among others.

A good understanding of the key barriers to optimal CKD care delivery is paramount for effective implementation of this integrated care framework.
BARRIERS TO EFFECTIVE CKD CARE DELIVERY IN LMICS

Workforce

Deficiencies in the nephrology workforce including nurses, general physicians, dialysis technologists, medical specialists, and nephrologists for the provision of adequate kidney care remains a critical problem in several LMICs. In developed countries, inadequacy of the nephrology workforce has been linked to an aging workforce, decreasing interest in nephrology among trainees, increasing cultural and ethnic disparities between patients and care providers, inflexible work schedules, and a reduced focus on scholarship and research funds; however, in LMICs, inadequate facilities for training and loss of trained personnel to developed countries largely account for the reduced numbers. As physicians and nurses leave their home countries to seek greener pastures, they leave a huge workforce gap behind to provide care for a rapidly growing and aging population. Such a pattern of migration often has been shown to be permanent. As a strategy to limit the decreasing nephrology workforce, comprehensive and effective nephrology workforce planning should be implemented that takes into consideration the structure and organization of the health system, existing care delivery models, nephrology workforce practices, and the size, quality, and success of internal nephrology training programs.

A sparse workforce for delivering care is an important reason to advocate strongly for integrated care in LMICs to improve efficiency, reduce the duplication of services, and improve the overall care of patients. This process could involve a task-shifting approach that uses trained nonphysician health care workers to perform health tasks to meet the needs of patients. This approach has been used extensively to tackle the human immunodeficiency virus (HIV)/acquired immune deficiency syndrome epidemic in sub-Saharan Africa. One systematic review on task shifting for HIV treatment and care in Africa reported increased access to antiretroviral therapies (ART) through expanded clinical capacity, improved cost effectiveness, and good agreement between nonphysician clinician decisions with physician decisions. Other studies also have reported overall good outcomes such available to provide service to the health care system will have a perpetuating effect on weakening the health care structures because fewer qualified health care workers will be available to train the next generation. As a strategy to limit the decreasing nephrology workforce, comprehensive and effective nephrology workforce planning should be implemented that takes into consideration the structure and organization of the health system, existing care delivery models, nephrology workforce practices, and the size, quality, and success of internal nephrology training programs.16

Figure 2. Strategies for the prevention of CKD.
as reduced rates of loss to follow-up evaluation of patients and improved roll out of ARTs when non-physician clinician-based care has been accessed in HIV treatment. A similar approach could be engaged to improve kidney care delivery using nurse-led care or pharmacist-led care in places where there is a shortage of doctors. Such care could be integrated into existing hypertension, diabetes clinics, or even within other areas such as HIV clinics. However, such approaches will need proper training and retraining of staff, adequate referral channels, and support structures to ensure success. Training can be facilitated by accessing nephrologists from various countries for hands-on training, setting up community screening programs, or staff training for task shifting through the International Society of Nephrology Educational Ambassador program (www.theisn.org/programs).

Infrastructure

Since the introduction of life-saving hemodialysis, nephrology, as a worldwide specialty, has lagged behind other internal medicine specialties, especially cardiology and oncology, including the capacity to conduct clinical trials, use of new medicines and technologies, and general infrastructure available to ensure adequate provision of care. Many countries still do not have adequate infrastructure necessary for the provision of basic nephrology services including laboratories to measure serum creatinine and report glomerular filtration rate (GFR), pathologic services for reporting kidney biopsy, medications, and treatment facilities such as for dialysis for end-stage kidney disease (ESKD) therapy. In Nigeria, for example, with an estimated population of 175 million people and a high prevalence of CKD, growth of hemodialysis (HD) units (each unit capable of supporting 10-20 patients at a time), increased from 56 in 2004 to 76 in 2014, pointing to a severe shortage of infrastructure for nephrology service provision. Limited infrastructure for manufacturing, transport, and storage of peritoneal dialysis (PD) fluids and high costs contribute to the low utilization of PD compared with HD in many LMICs.

The lack of such infrastructure is not limited to nephrology services but is widespread, affecting other aspects of medical care and social life. In Africa, with a high prevalence of HIV and despite recommendations from HIV treatment guidelines to estimate kidney function before the initiation of treatment as well as routinely during follow-up evaluation, especially if the patient is to be treated with a tenofovir-based regimen, this often is not feasible. One large study from Cape Town of 13,168 HIV-positive patients who started ART from 2010 to 2012 found a creatinine measurement for 88.9% at baseline in patients initiated on tenofovir and for 78.4% at 3 months. At baseline, 1.9% still were commenced on tenofovir despite an

### Table 1. Global Health Workforce: Physicians and Nephrologists

<table>
<thead>
<tr>
<th>WHO region</th>
<th>Physicians (N)</th>
<th>Physician Density per 10,000 Population</th>
<th>Nephrologist Density per 1,000,000 Population</th>
<th>Population Living in Urban Areas (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>33,183</td>
<td>2.7</td>
<td>1</td>
<td>38</td>
</tr>
<tr>
<td>The Americas</td>
<td>1,981,621</td>
<td>21.5</td>
<td>22 (North America); 8 (South America)</td>
<td>80</td>
</tr>
<tr>
<td>Europe</td>
<td>2,356,671</td>
<td>32.1</td>
<td>31</td>
<td>71</td>
</tr>
<tr>
<td>Southeast Asia</td>
<td>1,128,508</td>
<td>5.9</td>
<td>1</td>
<td>35</td>
</tr>
<tr>
<td>Income group</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low income*</td>
<td>213,982</td>
<td>2.5</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>(24,531)†</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower middle income‡</td>
<td>1,991,612</td>
<td>7.9</td>
<td></td>
<td>39</td>
</tr>
<tr>
<td></td>
<td>(323,860)‡</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper middle income§</td>
<td>3,755,703</td>
<td>16.1</td>
<td></td>
<td>62</td>
</tr>
<tr>
<td></td>
<td>(110,623)§</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High income§</td>
<td>3,186,223</td>
<td>28.7</td>
<td></td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>(153)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*African countries in this category include the following: Benin, Burkina Faso, Burundi, Central African Republic, Chad, Democratic Republic of Congo, Eritrea, Ethiopia, Gambia, Guinea, Guinea-Bissau, Kenya, Liberia, Malawi, Mali, Mozambique, Niger, Rwanda, Sierra Leone, Somalia, Togo, Uganda, United Republic of Tanzania, and Zimbabwe.
†Number of physicians in African countries is shown in parentheses.
‡African countries in this category: Cameroon, Congo, Cote d'Ivoire, Djibouti, Egypt, Ghana, Lesotho, Mauritania, Morocco, Nigeria, Senegal, South Sudan, Sudan, Swaziland, and Zambia.
§African countries in this category: Algeria, Angola, Botswana, Gabon, Libya, Mauritius, Namibia, South Africa, and Tunisia.
||African countries in this category: Equatorial Guinea.
estimated GFR less than 50 mL/min, potentially placing patients at risk of further kidney injury.\textsuperscript{30} Even in South Africa, resources are not always available to perform these tests and where they are performed there may be infrastructural gaps for physicians to be able to access results of tests performed from other institutions. The available infrastructure is likely much less in lower-income regions. Although it is not advocated for all institutions, especially at the primary care level, to be equipped with a laboratory, an opportunity to integrate CKD care may enhance care in other areas, and could include setting up services for collection of samples and mechanisms to ensure that such results are readily available to caregivers.

Cost of Treatment

Funding for various health care programs such as those for HIV, tuberculosis, and malaria in several LMICs come from external donors in developed countries.\textsuperscript{31} Although such funding is important in stimulating innovation and assisting with care in countries that are unable to meet the needs of the public health sector, the long-term sustainability is often in question. The cost of renal replacement therapies as well as the cost of care to prevent or retard progression of CKD continues to increase astronomically worldwide. Data from the United States show that treatment costs for ESKD in 2010 were 6.3% of the Medicare budget, whereas the costs for earlier stages of CKD were higher at 27% of the total Medicare budget in 2007.\textsuperscript{3} In many developed countries, such services are available for free at point of care. Patients in many LMICs often have to pay out of pocket to receive care for chronic diseases. A study from Cameroon analyzed the cost of diagnostic tests and essential medicines for cardiovascular disease and diabetes care, and showed that patients often needed to spend from up to one quarter to more than half of their monthly income to pay for a month’s supply of individual medications such as angiotensin-converting enzyme inhibitors or antidiabetic medications.\textsuperscript{32} Another study from Nigeria has shown that an inability to pay for dialysis was a huge factor accounting for the number of patients unable to continue treatment; only 3 of 227 patients were able to afford renal replacement therapy payment for more than 3 months.\textsuperscript{33} Cost, perhaps more than any other factor, remains the Achilles heel for CKD service delivery in many LMICs at both the primary care and tertiary care level. Therefore, this suggests a need for a radical change in the approach to CKD care in developing countries from one that centers on individual care to a population intervention strategy for the prevention of CKD. A population intervention approach could involve identifying the most effective ways of ensuring the availability of medicines to delay or prevent the progression of CKD (eg, availability of generic drugs, ensuring that only genuine drugs get into the market, an efficient drug regulatory authority to oversee the process, consideration of a polypill strategy).\textsuperscript{34} Other ways to reduce the overall costs for patients in places where patients pay out of pocket also can include reducing the frequency of unnecessary clinic visits (to reduce transportation costs) by integration of CKD care with that of other diseases, facilitating community-based care, and to only order laboratory tests that will assist in diagnosis and treatment. Such approaches will reduce the cost of treatment and are likely to improve CKD outcomes.

Emphasis for integration of CKD care in noncommunicable disease programs should focus on prevention and early detection. Utilization of World Kidney Day (www.worldkidneyday.org), which increasingly has become an opportunity to screen the general population for CKD in many countries, should be encouraged and broadened to assist with early disease detection. Other avenues also should be included to meet the goals of early identification of patients with risk factors as well as CKD (eg, World Hypertension Day, World Diabetes Day, and so forth). Research organizations also can assist this process by prioritizing screening and early evaluation of kidney disease programs or kidney early evaluation programs for kidney disease research funding in developing countries. Questions will arise regarding the cost effectiveness of screening or early detection programs,\textsuperscript{35} or how patients identified with early CKD in this setting will be managed, given that there are other limiting factors to accessing care. In the MAR-EMAR (Maladie Rénale Chronique au Maroc) study a screening and prevention program in Morocco, clinical follow-up visits were scheduled for patients identified with CKD stage 3a, 3b, and 4, and young subjects with a low estimated GFR for their age (< third percentile for age and sex category) to initiate appropriate interventions in those identified to be at risk of worsening kidney function.\textsuperscript{36} Through such programs, early disease detection and the awareness generated may bring about lifestyle changes or improve health-seeking behavior that will slow the progression of CKD.

Health Care Policies, Health Systems, and Health Care Funding

Effective health systems are strong elements of quality chronic disease care in all parts of the world.\textsuperscript{13} A dysfunctional health system will affect all important aspects in the chain of health provision including access to medicines, availability of workforce, funds for new technologies, legislation, and policies for health financing. Supporting health systems in LMICs...
remains challenging because of the profound impact of the double burden of communicable and noncommunicable disease epidemics they are facing, fragmentation of the health systems through the running of parallel programs, poor financing, lack of maintenance of existing programs, and levels of corruption in the health care sectors. Leadership is crucial to identify opportunities to improve health system functioning. It has become clear that the failure of leadership in tackling the HIV epidemic has contributed to various poor health outcomes including an exacerbated tuberculosis epidemic with the emergence of multidrug-resistant and extensive drug-resistant strains and thousands of preventable deaths. The development of sound policies targeted to the prevention of CKD and its risk factors in LMICs, as well as management strategies to improve the efficiency of health care delivery, can help to reduce the increasing burden of disease in these countries.

KIDNEY DISEASES AND INFECTIOUS DISEASES INTERSECTIONS: NEED FOR INTEGRATED HEALTH SYSTEMS

Many LMICs already have effective systems in place to handle the burden of communicable diseases such as HIV, tuberculosis, and malaria. In many instances, these systems have been supported through extensive funding from developed countries such as the US President's emergency plan for AIDS relief, which has provided significant funding for HIV treatment and research in Africa (www.pepfar.gov). Remarkably, several of these infections intersect with kidney disease either directly, by way of shared structural or socio-economic risk factors, or treatment. For example, CKD is an important cause of morbidity and mortality in HIV-positive patients, especially in the elderly, in those of black ethnicity, and in the presence of hypertension or diabetes. In addition, acute kidney injury (AKI) can occur in patients with HIV treated with some ART regimens such as tenofovir or related to co-infections or use of other antibiotics. Similarly, clearly defined links have been established between tuberculosis, malaria, and hepatitis infections with AKI or CKD. Kidney disease detection, prevention, and treatment therefore practically could be leveraged on established programs with infrastructure for communicable diseases care and control given these intersections with AKI and CKD. Such intersections have been identified and described in South Africa where HIV, tuberculosis, diabetes, and hypertension accounted for prescriptions in 45% of patients attending a primary care clinic and 22.6% had multiple morbidities; diabetes and hypertension were more prevalent in younger patients on ART than in patients not receiving ART. Because of multimorbidity in HIV patients in South Africa, Oni et al suggested a modification to the WHO ICCC model for LMICs to cover gaps in the ICCC framework related to management of comorbid noncommunicable and infectious chronic diseases. The proposed framework includes the increased complexity of treating comorbid noncommunicable and infectious chronic diseases patients and highlights the importance of biological interactions in disease. The framework is based on observations that patient experiences such as treatment adherence, health care use, and health outcomes are influenced by demands that the health system places on patients, which are especially difficult to meet for patients living in significant poverty. Strategies that focus on incorporation of biological interactions with considerations of demands placed on patients and health providers hold promise to make health systems more effective.

As an example, South Africa currently is implementing the integrated chronic disease management model (including HIV, tuberculosis, diabetes, hypertension, asthma, epilepsy, asthma, chronic obstructive pulmonary disease, and mental health illnesses), which builds on the strengths of the HIV/tuberculosis integrated program. The integrated chronic disease management focuses on restructuring of the primary health care system to improve efficiency through the use of clinical algorithms as well as training of community care workers in the prevention, promotion, and treatment of these diseases. The multimorbidity model further empowers patients and assists with self-management of their chronic diseases. CKD thus far is not managed within this model, however, integration of CKD care using existing programs would have the potential to reduce costs and improve efficiency for patients with kidney disease given that the same facilities are likely to be used, the staff requirement overall may be reduced (also saving cost), and patients' engagement with the health system is likely to be improved because care for various chronic diseases can be accessed in one location, with fewer clinic visits and better provider oversight of the whole patient.

USING THE EIGHT ESSENTIAL WHO ELEMENTS FOR ACTION TOWARD CKD INTEGRATED CARE IN LMICS

The ICCC framework outlines eight essential factors in the course of action to be pursued for integration based on the level of resources available. These points were developed to highlight elements that decision makers should be aware of, what the strength of the health system is for each factor considered, what should be performed to improve care delivery, with useful
examples provided that can be applied for each factor in low-, medium-, and high-resource settings.\textsuperscript{10}

It generally is assumed that applying an integrated approach to chronic disease management can be cost effective; however, there has been a general lack of cost evaluations of such systems, especially related to CKD care. Although some data suggest that an integrated approach to care can be cost saving, others have reported it to be expensive.\textsuperscript{49,50} Cost is always a barrier for developing countries and the current lack of data effectively may limit willingness to adopt an integrated care approach for CKD care, which is considered very expensive. Despite this, using the ICCC framework as building blocks for integrated CKD care in LMICs highlights important practical points that should be considered. Table 2 summarizes key information from the ICCC framework for decision makers that is pertinent to CKD care delivery, what can be performed within a country’s setting, and practical examples that can be followed. The key elements for action and information for decision makers relevant to CKD care are summarized later.\textsuperscript{10}

**SUPPORT A PARADIGM SHIFT ON KIDNEY DISEASES**

Policy makers must recognize that incidence and prevalence rates of CKD continue to increase globally owing to increases in diabetes, hypertension, obesity, and a rapidly aging population.\textsuperscript{2,51} CKD management and care is complex, often needing a multidisciplinary approach. For this to be effective, it requires a health system approach involving extended and regular health care contact to minimize CKD complications and to slow CKD progression.\textsuperscript{52} Various classes of medications are required to treat CKD adequately and therefore should be available in the country and affordable to patients to treat the different complications associated with CKD such as hypertension, anemia, mineral bone disease, and dyslipidemia.

**MANAGE THE POLITICAL ENVIRONMENT: GET THE POLITICIANS INVOLVED**

The planning and implementation of service delivery for effective CKD management will become more effective if it takes place within a political context. Given that there is considerable resource limitation in many countries, thought should be given to critical aspects of CKD care such as dialysis and kidney transplantation and governments must develop clear policies around access to such care where it is limited or unavailable. For example, few African countries (Egypt, Libya, Algeria, Tunisia, Morocco, South Africa, Mauritius, and Gabon) have a national dialysis program that is paid for by the government and capable of accommodating treatment for 100 dialysis patients per million population.\textsuperscript{53} In other countries, there has been no government policy or service planning from a political context. Planning for integrated CKD management should not be one-sided (from the policy makers), but must take into consideration health care leaders, patients, families, community members, traditional health practitioners, and organizations that represent kidney disease patients. For positive transformation toward care of CKD, information should be shared and readily available across groups and a need for political commitment and consensus building among stakeholders at each stage.

**BUILD INTEGRATED HEALTH CARE FAVORABLE FOR CKD MANAGEMENT**

Effective health systems for CKD care requires integration to ensure shared information across settings and providers, and across time. For example, systems should be in place to have access to electronic health records (eg, serum creatinine levels) from different hospitals within the same town and banked for access across time. Estimated GFR reporting for all laboratory reporting of serum creatinine levels also should be implemented because this becomes a useful clinical value for all those assessing or interpreting the results and assists in identifying patients with CKD.\textsuperscript{7,54} Coordinating financing across different arms of health care (eg, inpatient, outpatient, and pharmacy services) and incorporation of community resources (eg, transportation) that all can improve the efficiency of overall health care services.

**ALIGN ALL SECTORAL POLICIES TO IMPROVE KIDNEY HEALTH**

The policies of all government sectors (eg, national, provincial, and local government) for CKD care should be aligned to maximize health benefits.\textsuperscript{26} Kidney care policies should be aligned with broader legislative frameworks.

**USE HEALTH CARE PERSONNEL MORE EFFECTIVELY FOR CKD PREVENTION AND MANAGEMENT**

Nurses, physicians, dialysis technologists, kidney transplant coordinators, and nephrologists need to be adequately trained and re-trained using new team care models and evidence-based skills for managing CKD. If accompanied by health system restructuring, task shifting to nonphysician health care workers for certain aspects of CKD prevention and management is a
<table>
<thead>
<tr>
<th>Essential Element</th>
<th>Information for Decision Makers</th>
<th>What Can Be Done</th>
<th>Action Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Support a paradigm shift</strong></td>
<td>Support a paradigm shift</td>
<td>Incidence and prevalence rates of CKD continue to increase globally owing to diabetes and other risk factors. CKD management and care require a different health system approach involving extended and regular health care contact to minimize CKD complications or slow progression. Several medications are needed for CKD care and therefore should be available and affordable to effectively manage the different aspects of CKD.</td>
<td>Provide leadership and advocacy to integrate policies on CKD.</td>
</tr>
<tr>
<td><strong>Manage the political environment</strong></td>
<td>Policy making and service planning for CKD care must be effective from a political context. Planning for integrated CKD management should not be one-sided (from the political class); other constituents such as health care leaders, patients, families, community members, and organizations that represent kidney disease patients should be involved. Need for information sharing across groups and for consensus and political commitment among stakeholders at each stage.</td>
<td>Provide leadership and advocacy to ensure quality through leadership and incentives.</td>
<td>Educate and inform patients, families, and other influential people about the growing burden of CKD and strategies for managing CKD in the country’s context. Build a dialogue with key leaders in the government, health care organizations, and communities to better understand their values and interests. Use health care opinion leaders and community leaders to advocate for change in local contexts.</td>
</tr>
<tr>
<td><strong>Build an integrated health care system for CKD management</strong></td>
<td>Effective health systems for CKD care cannot remain fragmented but require integration to ensure the following: (1) Shared information across settings and providers, and across time (2) Coordinating financing across different arms of health care (eg, inpatient, outpatient, and community).</td>
<td>Integrate policies to enhance CKD care. Use information systems to mobilize and coordinate resources for CKD care.</td>
<td>Ensure that policies, plans, and financing structures for CKD care are up to date. Collect data on the incidence and prevalence of CKD. Develop kidney disease registries. Collect data on the incidence and prevalence of CKD. Develop kidney disease registries.</td>
</tr>
</tbody>
</table>

Table 2. Summary of Eight Essential Elements for Improving CKD Care With Examples for Using an Integrated Care Approach
<table>
<thead>
<tr>
<th>Essential Element Information for Decision Makers</th>
<th>What Can Be Done</th>
<th>Action Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Align all sectoral policies to improve kidney health</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pharmacy services</td>
<td>(3) Incorporating community resources (eg, transportation) Improved care of CKD; less waste, less inefficiency, and a less frustrating experience for patients as the final outcome of an integrated CKD care process</td>
<td>Form links with private sector health workers. Form links to nonhealth government sectors that have the potential to influence population health. Support regulation and legislation that curbs the marketing of public health risks (eg, high-salt diet, tobacco, and alcohol). Implement population-based prevention activities in collaboration with other government sectors.</td>
</tr>
<tr>
<td>Use health care personnel more effectively for CKD prevention and management</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nurses, physicians, dialysis technologists, kidney transplant coordinators, and nephrologists need to be adequately trained and re-trained using new, team care models and evidence-based skills for managing CKD. Importance of stressing task shifting to nonphysician healthcare workers in certain instances of CKD management.</td>
<td>Promote basic skills training for health care workers who are involved in treating patients with CKD. Where there are multipurpose health workers, study possibilities of reinforcing their decision making via linkage with specialists.</td>
<td>Develop patient information-sharing strategies across health care organizations and communities.</td>
</tr>
<tr>
<td>Center CKD care on the patient and family</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prevention and management of CKD requires several lifestyle changes (eg, smoking cessation, use of low-salt diet, reduction of alcohol ingestion, weight loss, and so forth), hence the need for patient involvement in this process to achieve</td>
<td>Provide basic information about CKD management to patients and families. Include self-management support instruction during health care interactions.</td>
<td>Develop educational and skill-building workshops for patients and families on the management of CKD. Use written educational materials to supplement self-management messages.</td>
</tr>
</tbody>
</table>

I.G. Okpechi et al.
| Support CKD patients in their communities | CKD care should not start and end in the clinic, dialysis unit, or hospital, but ought to extend into the home and working environment (e.g., enforcement of smoke-free areas, provision of clean water). Patients and families need services and support from other institutions in the communities. Communities can fill gaps in health services that are not provided by organized health care (e.g., transport services for patients traveling from remote locations). | Safe environments conducive to health | Outreach programs to encourage better CKD outcomes through leadership and support. Increase CKD awareness in communities. Mobilize and coordinate resources for CKD care. Provide complementary services. | Support and involve community groups and NGOs in providing care for CKD. Establish a structure for information exchange on policies and sharing of strategies between health care organizations and community-based services. Support the roles of community organizations in policy making and service planning. | Develop patient information-sharing strategies across health care organizations and communities. Ensure employers are informed about CKD management and take steps to support prevention and self-management efforts in the workplace. |

| Emphasize CKD prevention (i.e., screening and early detection programs) | CKD can be prevented or its progression slowed by adequate control of known risk factors such as diabetes and hypertension. Complications of CKD and its risk factors can be minimized through adequate and appropriate initiation of treatment. Early detection programs should form components of CKD care. | Integrate policies to strengthen partnerships to enhance CKD care. Support legislative framework that covers CKD care. | Organize and equip health care team. Support self-management and prevention. Use information systems. | Provide complementary services. Ensure that prevention of CKD is addressed in primary health care visits. Provide health workers with information and basic skills to help patients minimize risks associated with CKD. Support regulation and legislation that curbs the marketing of public health risks. Support population-based CKD prevention activities. | Monitor risk factors and identify persons at risk for developing CKD. Assist providers through education and tools to put prevention first. Ensure that every CKD patient encounter addresses factors that can slow progression. Align provider incentives so that prevention efforts are rewarded. |

Abbreviations: CME, continuous medical education; HCO, health care organization; HRS, high-resource setting; LRS, low-resource setting; MRS, medium-resource setting; NGO, non-governmental organization.
potentially effective and affordable strategy to improve access to care. One systematic review found improved health outcomes when task shifting was compared with usual health care, including reductions in blood pressure, increased uptake of medications, and lower depression scores.\textsuperscript{55} Task shifting also has been used effectively in the management of patients with HIV\textsuperscript{56} and could be leveraged toward the prevention and treatment of CKD, at least within the HIV population in these settings.

**CENTER CKD CARE ON THE PATIENT AND FAMILY**

Prevention and management of CKD requires several lifestyle changes (eg, smoking cessation, use of low-salt diet, reduction of alcohol ingestion, weight loss), hence the need for patient involvement in this process to achieve good outcomes.\textsuperscript{57} Patients and family members must be involved as active players in the process of provision of effective care, for instance, allowing them to make a choice of dialysis modality.\textsuperscript{58} Shared decision making is an important process because it promotes the rights of patients to be involved in decision making concerning their health.\textsuperscript{59} For example, in South Africa, because of dialysis rationing, modality choice often is not discussed with the patient even when there are open spaces in HD and PD. Discussing modality options with patients raises them to a position in which they can participate in their own management and be better placed to understand the dynamics and constraints of modality selection.

**SUPPORT CKD PATIENTS IN THEIR COMMUNITIES**

CKD care should not start and end in the clinic, dialysis unit, or hospital, but ought to extend into the home and working environments (eg, enforcement of smoke-free areas, provision of clean water). Patients and families need services and support from other institutions in the communities. Communities can fill gaps in health services that are not provided by organized health care (eg, transport services for patients traveling from remote locations). A cross-sectional study of patients receiving hemodialysis in the hospital and in the community in Hong Kong found that patients receiving dialysis in the community setting had a better health-related quality of life.\textsuperscript{60} Although the reason for this was not clear, it does suggest a positive impact and a positive role of the community on patients with CKD.

**EMPHASIZE CKD PREVENTION: SCREENING AND EARLY DETECTION PROGRAMS**

CKD can be prevented or its progression slowed by adequate control of known risk factors. Complications of CKD and its risk factors can be minimized through adequate and appropriate initiation of treatment. Early detection programs are important components of CKD care, especially in LMICs where ESKD treatment is not accessible. Few countries have screening programs,\textsuperscript{53} and although there are no randomized controlled studies, some data suggest that early CKD identification and initiation of treatment for risk factors can slow progression and improve patient outcomes.\textsuperscript{61,62} CKD awareness is low and the prevention of CKD can occur through improving awareness; a medical screening program in Taiwan reported that less than 4% of patients with CKD (ie, 12% of the surveyed population) were aware of their condition.\textsuperscript{63} Awareness of CKD risk factors such as diabetes and hypertension also have been reported by several studies to be low.\textsuperscript{64–67}

**CONCLUSIONS**

Integrated care for chronic diseases is a challenge for most LMICs. Application of the ICCC framework, however, may be adapted to the needs in the population and can have a positive impact on CKD care and management including early disease detection and use of a variety of health care workers to maximally improve outcomes. It is possible for countries with established and functioning programs dedicated to the treatment and control of communicable diseases to leverage existing infrastructure to integrating kidney disease screening and care in their population. For CKD in particular, a focus on prevention should be a key strategy in many countries where care for later stages of CKD is prohibitively expensive, and efforts to establish screening and monitoring programs for early detection of CKD as well as risk factors should be prioritized.

**REFERENCES**

6. Kerr M, Bray B, Medcalf J, O'Donoghue DJ, Matthews B. Estimating the financial cost of chronic kidney disease to the


46. Ônö T, Youngblood E, Boulle A, McGrath N, Wilkinson RJ, Levitt NS. Patterns of HIV, TB, and non-communicable disease


