



ISSN: 2578-3335 (Print) 2578-3343 (Online)

Volume 5 | Issue 1

Article 4

2023

Implementation Barriers of Multidisciplinary Care in Chronic Kidney Disease Through a CFIR Framework: a Narrative Review

Max J. Goodman

Medical College of Wisconsin, mgoodman@mcw.edu

Amalia Jereczek

Medical College of Wisconsin, ajereczek@mcw.edu

Cooper Rowan Medical Journal: <https://rdw.rowan.edu/crjcsm>

Would you like to be a reviewer? Please fill in this [short form](#) to express your interest.

Recommended Citation

Goodman, Max J. and Jereczek, Amalia (2023) "Implementation Barriers of Multidisciplinary Care in Chronic Kidney Disease Through a CFIR Framework: a Narrative Review," *Cooper Rowan Medical Journal*: Vol. 5: Iss. 1, Article 4.

DOI: 10.31986issn.2578.3343_vol5iss1.4

Available at: <https://rdw.rowan.edu/crjcsm/vol5/iss1/4>



This work is licensed under a [Creative Commons Attribution 4.0 License](#).

This Reviews is brought to you for free and open access by the Rowan University Journals at Rowan Digital Works. It has been accepted for inclusion in Cooper Rowan Medical Journal by an authorized editor of Rowan Digital Works. For more information, please contact brush@rowan.edu.

Implementation Barriers of Multidisciplinary Care in Chronic Kidney Disease Through a CFIR Framework: a Narrative Review

Cover Page Footnote

We would like to thank Professor Jennifer Campbell for her guidance on implementation science and chronic kidney disease.

Narrative Reviews

Implementation Barriers of Multidisciplinary Care in Chronic Kidney Disease Through a CFIR Framework: a Narrative Review

Max Justin Goodman¹ , Amalia Jereczek¹ 

¹ Medical College of Wisconsin

Keywords: Chronic Kidney Disease, End-Stage Renal Disease, Multidisciplinary Care, Implementation Science, Consolidated Framework for Implementation Research

https://doi.org/10.31986/issn.2578.3343_vol5iss1.4

Cooper Rowan Medical Journal

Introduction

37 million Americans suffer from chronic kidney disease, which affects multiple organ systems and requires multidisciplinary care. Multidisciplinary care is an inherently broad and complex topic, and while it is being implemented across health care in the United States and abroad, multidisciplinary care outcomes are poor in this patient population. It is possible that there exist gaps in the literature regarding implementation and replication of multidisciplinary care interventions such that health care practices are unable to fully take advantage of multidisciplinary care publications for chronic kidney disease. This narrative review utilizes the five domains of the Consolidated Framework for Implementation Research to address barriers to multidisciplinary care implementation for chronic kidney disease.

Methods

A systematized review of peer-reviewed literature including systematic reviews and meta-analyses related to chronic kidney disease and multidisciplinary care through January 1, 2021 was conducted. The five interventions with the most barriers qualitatively identified were analyzed.

Results

Twelve potentially eligible reviews were identified, and 5 unique systematic reviews and meta-analyses were selected for a total of 48 articles, and ultimately, 5 articles were selected for inclusion. Based on the Consolidated Framework for Implementation Research which includes 5 domains of barriers, we discussed barriers of implementation in all 5 domains within the 5 articles.

Discussion

Because it is essential that multidisciplinary care for patients with chronic kidney disease be improved and implemented to the fullest extent, researchers should be aware of barriers to implementation and publish results by taking into account the Consolidated Framework for Implementation Research.

BACKGROUND

It is estimated that more than 1 in 7, or 37 million, United States adults suffer from chronic kidney disease (CKD).¹ CKD is when the kidneys become damaged and are unable to filter electrolytes and toxins out of the body in addition to regulating extracellular water. Depending on the glomerular filtration rate (GFR), CKD is classified into five stages of progressively worsening kidney damage and clinical outcomes, which can cause or be caused by other devastating comorbidities and is associated with worsening risk of death.^{2,3} The most common causes of CKD include but are not limited to hypertension, diabetes, obstruction, malignancy, injury, congenital, and more. The fifth CKD stage

is end-stage renal disease (ESRD), which is characterized by when the kidneys permanently fail to function. Almost 800,000 adult patients are treated annually for ESRD in the United States, totaling to a prevalence of 2,382 per million.¹ Besides ESRD being a fatal disease, CKD is associated with multisystem complications including cardiovascular, rheumatological, gastrointestinal, hematological, and neurological that reduce quality of life and life expectancy.^{4,5}

Because CKD affects the body on a multisystem level, its comorbidities and symptoms may be too complex for one specialist like a primary care physician or a nephrologist to treat. Multidisciplinary care (MDC), or the practice of a team of various specialty healthcare workers, is encouraged for CKD patients and is being implemented widely across

healthcare practices; however, there are debates about which forms of MDC are most effective, if any. As the following research studies that will be discussed demonstrate, it is difficult to implement effective MDC models from both a clinical and research standpoint, which ultimately impacts clinical outcomes and quality of life in CKD patients. As inherently multifaceted as CKD is, which may explain why MDC outcomes are often poor,^{6,7} there are also many components to the very structure of designing and explaining a CKD-MDC intervention for implementation that present as barriers to their own success. However, CKD-MDC research lacks studies that address how interventions fail to meet the needs of their stakeholders including but not limited to CKD patients, healthcare practices, and the healthcare team, or be adequately described in the literature.

FRAMEWORK

The Consolidated Framework for Implementation Research (CFIR) is a conceptual framework that guides through contexts of an intervention to identify factors that influenced its implementation and effectiveness.⁸ CFIR was first published in 2009 and is most commonly used for complex health care delivery interventions to address barriers to implementation based on five domains: intervention characteristics, inner settings, out settings, characteristics of individuals, and implementation processes. Based on its description, CFIR is likely an effective model to address the knowledge gap faced in CKD-MDC research. There are many frameworks within implementation science; another one that was considered for this paper was the Reach, Effectiveness, Adoption, Implementation, Maintenance (RE-AIM). RE-AIM provides practical effective implementation planning for evidence-based interventions but lacks the ability to evaluate ways implementation succeeds and fails. In one study that compared CFIR to RE-AIM in terms of their implementation planning processes for an asthma intervention, it was concluded that CFIR was capable of “explain(ing) *why* implementation succeeded or failed, and when used proactively, identifies relevant modifiable factors that can promote or undermine adoption, implementation, and maintenance.”⁹

CHARACTERISTICS OF THE INTERVENTION

The first domain of CFIR is the characteristics of the intervention being implemented. This includes adaptability, as many interventions cannot be implemented into practice without a detailed methodology by the authors for others to attempt. Another component is the intervention source, or how key stakeholders came to develop the intervention whether through stakeholders or previous research. Characteristics of the intervention are also best described through the evidence strength or quality; this is typically defined through the perception of stakeholders through anecdotes, quantitative data or other publications. Stakeholders may also desire a comparison of the intervention to other alternatives and previously used interventions. As the objective of any implementation research is to encourage further utilization or not, the complexity, whether by

number of steps, overlapping points, teams, patient types, and other aspects that would reflect the difficulty of implementing the intervention should be described. A similar characteristic is trialability, or how easy or difficult it is to test an intervention on a small scale relative to the organization. Finally, the cost of the intervention whether by monetary value, supply usage, opportunity cost, and time should be mentioned; this is arguably the most important characteristic for investors, yet is often not included in publications.

OUTER SETTING

The outer setting is based on the barriers that patients may face when interacting with healthcare interventions and organizations within the context of a community or society. This requires the organizations to have as much of a patient-centered approach as possible without sacrificing quality care. A component of that is how connected or bridged an organization is to other external organizations, which is described as cosmopolitanism. An organization may also be more likely to attempt or implement interventions if they face competition by other organizations in the healthcare market, or they may also be forced to attempt an intervention if they are mandated by external policies. These points should be mentioned in implementation research to provide readers context, especially when there are many external structures research participants experience for any clinical research.

INNER SETTING

Another domain is the inner setting, or the structures that influence and interact beyond the person within an intervention. Most notably, this includes the structural characteristics of an organization, such as how large it is, how established it is, and if the organization is made up by divisions or is centralized. Other components include how the organization communicates internally whether formally or informally, and if hierarchy plays a role in how communication is done. Culture is essential as well; the organization must encourage change to their method of operation for an intervention to succeed. This is different from the climate, or whether an organization has the appropriate priorities, policies, and learning aptitude for implementation. Typically for implementation research to be completed, at least one aforementioned aspect of the inner setting must be in place and helps readers understand the organizational environment in which the intervention took place.

INDIVIDUALS INVOLVED

Unlike the inner setting, which involved the structure of an organization, this component focuses on an organization's employees, such as their roles, skills, beliefs, behaviors, and other personal attributes. Often, an organization either attracts or is impacted by the individuals who are employed there; so while the individuals and the inner setting can appear overlapping, they are actually different. For example, individuals involved must be familiar with the inter-

vention and how to operate it, which is known as self-efficacy. Whether they are enthusiastic about the intervention or doing it as part of their job is also very important towards the outcomes of an intervention, yet is seldom discussed. Some individuals may even be resistant to the intervention which can be due to tradition or fear of being replaced or the potential extra workload. These are important to mention so readers can get a sense of who was involved and how comparable it would be to replicate it in their own practice.

IMPLEMENTATION PROCESS

The final component is the process of implementation. It may involve how an intervention is planned, whether stakeholders are considered, if strategies are tailored to patients, and if simulations are created. Engagement is also a part of the implementation process and includes carefully selecting members and leaders. Some people may require training, and it is useful to mention whether the members volunteered or were appointed their roles. Carrying out the implementation is part of its executing and is best understood through fidelity. The last aspect of the implementation process is reflecting and evaluating progress, success, failures, and giving and receiving feedback during and after implementation.

OBJECTIVE

In this systematized narrative review, CFIR will be utilized to identify barriers in five CKD-MDC intervention research publications to inform stakeholders on how they should change their approach towards maximizing outcomes.

METHODS

PubMed was searched from inception to January 1, 2021. The search was limited to articles in English. The search strategy used was (chronic kidney disease, end-stage renal disease OR chronic renal failure AND multidisciplinary care OR interdisciplinary care OR team-based care AND meta-analysis AND systematic review (meta-analysis[Filter] OR review[Filter] OR systematicreview[Filter])) AND (chronic kidney disease). Each article was screened by one reviewer for eligibility by screening the title followed by the abstract and then the full text. Meta-analyses or systematic reviews of MDCs that investigated the associations between their intervention and CKD-related outcomes were eligible. A reviewer searched within the reviews for studies that compared an intervention to a type of control such as standard therapy or placebo. Studies that were excluded included single-arm studies. It did not matter if meta-analyses and systematic reviews utilized the same publications, as our analysis remained relevant to the outcomes of individual interventions and CFIR. If reviews highlighted similar interventions, the intervention with the largest number of patients was considered. It was decided prior to conducting the review that the five articles with the most barriers qualitatively identified under CFIR during screening would be analyzed. The search strategy identified 12 potentially eli-

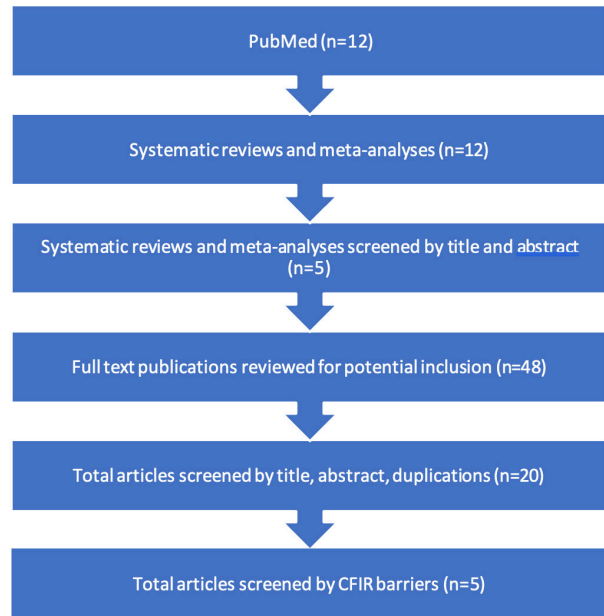


Figure 1. Flow chart of the selection process of eligible studies.

gible reviews. After the screening process, five unique systematic reviews and meta-analyses were chosen, which accounted for a total of 48 articles.^{6,7,10-12} Based on the criteria above, 28 articles were excluded which left 20 articles eligible. Ultimately, 5 articles were selected for inclusion for having the most identifiable CFIR barriers (see [Figure 1](#)).¹³⁻¹⁷

ARTICLE RESULTS AND CFIR INTERPRETATIONS

Article results and interpretation of the barriers faced in each intervention will be discussed based on the 5 domains of CFIR and are also represented in [Table 1](#).

In Hemmelgarn et al. in 2007, stage 3 or greater CKD patients were referred to an MDC which included a specialized clinic nurse, a registered dietician, and a social worker and were educated on effects of medication, complications, fluid and diet, blood pressure, exercise, and more with a focus on lifestyle modification and medical management.¹³ The MDC group initiated dialysis more likely by almost 30 times and were more likely to survive over 3.5 years' time when not adjusted and when adjusted for factors like age, gender, GFR, diabetes, and comorbidity score. Even when adjusted for hemoglobin and albumin, there was no change in these results. When unadjusted and adjusted for the aforementioned factors however, there was also no difference in risk of hospitalization. Therefore, what the study finds is that the MDC of this type can improve survival outcomes but cannot change the risk of hospitalization.

In a 2005 investigation by Patel et al., 5% of adults diagnosed in 2002 with diabetes or hypertension in a primary care clinic network in Columbus, Ohio were screened for CKD based on two laboratory values for GFR.¹⁴ If a patient was diagnosed with CKD, a clinical pharmacist reviewed the patient's medication records and based on standardized

Table 1. Summary table of the main articles based on CFIR domains

Study	MDC type	Five Domains of CFIR				
		Individuals Involved	Characteristics of the Intervention	Outer Setting	Inner Setting	Implementation Process
Hemmelgarn et al., 2007 ¹³	specialized clinic nurse, a registered dietician, social worker	(-) Personal attributes (-) Beliefs/behaviors	(-) Adaptability (-) Evidence strength/ methodology (-) Cost	(-) Outer setting	(-) Structural characteristics of an organization (-) Networks and communication (-) Culture/climate	(-) Executing (-) Reflecting and evaluating
Patel et al., 2011 ¹⁴	clinical pharmacist, primary care physician	(+/-) Personal attributes (-) Beliefs/behaviors	(+) Cost (+) Complexity (+) Adaptability (+) Trialability	(-) Outer setting	(+/-) Networks and communication (+/-) Structural characteristics of an organization (+/-) Culture/climate	(-) Executing (-) Reflecting and evaluating
Blakeman et al., 2014 ¹⁵	lay health worker	(+/-) Personal attributes (+/-) Self-efficacy (-) Beliefs/behaviors	(+) Intervention source (+) Evidence strength/ methodology (+/-) Cost	(+/-) Cosmopolitanism	(-) Structural characteristics of an organization (-) Networks and communication (-) Culture/climate	(+) Planning (+) Engaging (-) Executing (-) Reflecting and evaluating
Barrett et al., 2011 ¹⁶	nurse-team nephrologist, general practitioner	(+/-) Personal attributes (+/-) Self-efficacy (-) Beliefs/behaviors	(+) Design quality (+) Adaptability (+) Trialability (-) Cost	(-) Outer setting	(+/-) Networks and communication (+/-) Culture/climate	(-) Executing (-) Reflecting and evaluating
Sherpbier-de Haan et al., 2013 ¹⁷	nurse practitioner, general practitioner, nephrology team	(+/-) Personal attributes (-) Beliefs/behaviors	(-) Methodology (-) Adaptability (-) Trialability	(-) Outer setting	(-) Structural characteristics of an organization (-) Networks and communication (-) Culture/climate	(+) Engaging (-) Executing (-) Reflecting and evaluating

(+) = characteristic mentioned in article

(+/-) = characteristic implicitly mentioned in article

(-) = characteristic not mentioned in article

criteria, if a drug-related problem was found, the pharmacist would recommend changes in the patients' charts. Altogether, 69% of patients had a stage of CKD, and there was an average of 3.2 drug-related problems the pharmacist found in 99% of CKD patients. Unfortunately, only 41% of recommendations by the pharmacist were accepted by the patients' physicians, often due to patient nonadherence, patient resistance, and prescriber preference.

In Blakeman et al. in 2014, stage 3 CKD patients in England from 24 practices in the bottom 20% most deprived areas in England were randomized to be guided by a lay health worker to use a kidney information guidebook and a self-assessment tool/community resource booklet and website.¹⁵ Patients were then phoned by a lay health worker one week after to help patients identify needs and preferences and were offered local resources. One month after, patients were called again to see if patients attempted the local recommendations and to try once more to assist patients. Altogether, there was a modest improvement in quality of life as well as a maintenance in blood pressure and a cost saving of around £175.

In 2011 by Barrett et al., older adult patients with a GFR between 25 and 60 mL/min per 1.73 m² across five urban centers in Canada were randomized to meet every four months with a nurse-team every four months who also were connected to a nephrologist and general practitioner.¹⁶ All patients had the same aims, and all received annual lab tests which were made available in their medical records. There was found to be no difference in any way between the intervention group and the control group, however. Even though satisfaction was very high, results conclude that a nurse-coordinated model is inadequate for CKD care.

Finally, in the study by Scherpbier-de Haan et al. in 2013, nine general practices in the Netherlands which included 181 CKD patients had an MDC consisting of a nurse practitioner, a general practitioner, and a nephrology team.¹⁷ The nurse practitioners and general practitioners were trained by a nephrology team and were taught about topics including but not limited to blood pressure measurement, blood-glucose management, and lifestyle advice, with the protocol based on the Kidney Disease Outcomes Quality Initiative guideline. Patients that were enrolled in the intervention saw a nurse practitioner every 3 months for 20 minutes for one year and worked on treatment goals and priorities. General practitioners supervised, and then those two consulted nephrology teams digitally. Altogether, blood pressure in the intervention group decreased by 8.1/1.1 on average after one year while the control group slightly increased by 0.2/0.5, and 44% of those in the intervention group reached their treatment goals compared to 21% in the control group. It was also found that the intervention group was placed on more lipid-lowering drugs, angiotensin-systems inhibitors and vitamin D than the control group; and parathyroid hormone levels and low-density lipoprotein levels were lower in the intervention group than the control group.

CHARACTERISTICS OF THE INTERVENTION

Of the five articles selected, all five had structural characteristic barriers whether as a component of the methodology or identified through the results. In Hemmelgarn et al.,¹⁵ many characteristics of the intervention were not highlighted. While authors said the MDC is adjusted per patient, there was no information provided to prove that statement, which calls into question this investigation's exact adaptability. Little information regarding the methodology or the evidence strength was provided as well. No mention of cost was made, so possible shareholders including investors would likely be hesitant to implement the results of this article too. Similarly, while results of the study by Scherpbier-de Haan et al. were promising with strong evidence quality,¹⁷ a lack of other structural characteristics mentioned in this paper make it difficult to replicate or implement again. How the training was conducted, the duration of the training sessions, and who were included in the nephrology teams were not included. The mechanism of this digital environment used between members was not discussed, nor was it explained whether or not certain consultations were to assist with goals or future patient visits. It is unknown the trialability of the intervention or how costly it was too.

In contrast, Patel et al. mentions some characteristics of the intervention.¹⁴ The authors highlighted that their intervention did not appear to be costly from a resources perspective, nor was it complex, unadaptable to implement, and difficult to trial. Even more detailed, Blakeman et al. included a thorough description of many characteristics including the intervention source originating from other complex diseases.¹⁵ This in addition to descriptions of training lay health workers, monitoring patients, and designing the guidebook and community resources. However, the defining feature noted in this article was cost. The paper mentioned that this intervention saved the patients an average of around £175 to their healthcare infrastructure, but it did not include how costly it was to train the lay workers and employ them as well as the cost of making and maintaining the number of guidebooks and websites offered. Prospective stakeholders may question implementing this research, as £175 saved on average may not amount to enough for the complexity of this intervention. Additionally, a majority of the intervention characteristics in the paper by Barrett et al. were well met such as design quality in that very specific outcomes including time and objective health measurements were studied.¹⁶ The paper also was very adaptable for further implementation research in that they made very specific health aims for their patients. The authors made a thorough attempt to describe the trialability of this intervention within urban centers, but no mention of cost was made beyond the time added onto nurses. This can be seen as disadvantageous, as some stakeholders may want to understand how much money was spent implementing this intervention. However, financial stakeholders may be able to reach their own conclusion about the cost based on their own nurse salaries and the additional time nurses spent operating the intervention.

Altogether, many of the barriers to CKD-MDC implementation research as it relates to characteristics of the intervention are not only what is specifically identified by the authors but what is failed to be mentioned.

OUTER SETTING

Of the five articles included, only Blakeman et al. attempted an MDC intervention based directly on the outer setting.¹⁵ While the researchers designed a kidney information guidebook, a self-community resource booklet, and website with lay health workers for CKD patients, there was not a formal agreement made between the 24 English practices and the external resources, which makes cosmopolitanism questionable. This represents a barrier in that there may be lacking established connections between nephrology clinics and centers to other external resources that could potentially improve outcomes and save costs. A concern is also that few patients utilized local resources, and in fact, fewer patients in the intervention arm utilized their own social networks compared to control patients. It is noted given the results that patients may be overconfident about their level of self-management for CKD. Another explanation is that patients do not infer community resources to be helpful, or that community resources are difficult to access as well. This patient population consisted of the lowest 20% socioeconomically in England, so access would be a potential concern. Overall, there are not many CKD-MDC interventions that utilize or acknowledge the outer setting. This is unfortunate as over half of late-stage CKD patients are non-adherent to treatment, which has been linked to the outer setting.¹⁸

INNER SETTING

The inner setting is a common barrier to CKD-MDC research. A barrier found within the five studies was how infrequently the inner setting was described. For example, little was said about the structural characteristics of the investigation by Hemmelgarn et al.¹³ Even though they mentioned the clinic had almost 7000 patients, they did not describe what type of clinic this was and if it was for CKD patients only. This is arguably more important than the database they used to acquire patient information they lacked, which was well described as the Calgary Health Region and includes over 1.1 million residents' health information. No information can be gathered about how the organization communicates or is structured in addition to the culture or climate. Similar points can be made in the study by Scherpbier-de Haan et al.¹⁷ This is in contrast to Patel et al.,¹⁴ who specifically identified a lacking inner setting in their primary clinic network in that few physicians accepted recommendations from pharmacists. The results are somewhat due to the indirect method of communication within the organization's divisions, whereby communication was made through patients' electronic medical record tabs. Based on the characteristics of the intervention in describing the inner setting, the authors could recommend structural changes to patient monitoring and greater collaboration between the physician and pharmacist divisions.

Within the paper as well, they included a specific section about the setting of the primary care network including who they serve, how many patients they see, the size of the clinics, and what services they offer. This offers readers an idea about how the inner setting both played a role in how the investigation was structured and the outcomes found. Given the investigation took place in one health-care network, a thorough summary of the inner setting is much more feasible in Patel et al. paper than in Blakeman et al.,¹⁵ which took place within 24 practices across England. Such practices, due to their differences in location, size, and patient population would be difficult to describe but likely played a role in the outcomes of the investigation. It does appear overall though that the practices allowed the lay health workers to have an independent role between themselves and community resources, which implies a division amongst the practices and their communities. Unlike Patel et al.,¹³ which seemed to lack organizational communication, Barrett et al. had the opposite dilemma of having too much organizational communication.¹⁶ What authors noted in their investigation was that the 5 urban Canadian centers that were involved in the study all had open communication across their divisions, such that actions and effects made by the nurses and physicians in the intervention could be altered by healthcare workers who were not a part of the experiment. This is an interesting phenomenon whereby open communication played a potentially negative role in the outcomes of the intervention. We can assume overall, however, that the culture and climate within the organizations for all five papers were positive towards change given their attempts to establish and test new MDCs.

INDIVIDUALS INVOLVED

The component of "Individuals involved" in CFIR is often neglected in research. However, of the five articles, four mentioned the individuals involved to some extent as described above. For example, in Patel et al.,¹⁴ only 41% of recommendations by the pharmacist were accepted by the patients' physicians with one reason being prescriber preference. This result can be seen as the physicians of that network being resistant to the intervention's attempt to have pharmacists play a greater role in patient care. Little can be said about resistance or enthusiasm in Blakeman et al.,¹⁵ however, a major barrier faced was the lay workers' skillsets. The lay workers were staff members, postgraduate students, and undergraduates at the University of Manchester. While the intervention was meant for the lower 20% socioeconomically in England, most of the lay workers were described as having limited knowledge in health and social care. Their skillset was being able to facilitate referrals to CKD patients on local resources and how to use the guidebooks over the telephone. It is questionable then how capable the lay workers could refer CKD patients to the correct community resources without advanced knowledge of CKD and the social barriers CKD patients face. Just like the lay workers in Blakeman et al. may have had too much expected of them, the same may be said for the nurses in Barret et al.¹⁶ The study by Barret et al. found that their methodology resulted in nurses having 16 times the num-

ber of minutes spent with the patient than the doctors without significant patient outcome improvement. It is unlikely that shareholders would be interested in an intervention that overutilizes nurses without any benefit. It is also questionable then how trained the nurses were for the intervention and whether they were familiarized to the potential additional workload. A similar criticism can be made in Scherpbier-de Haan et al.,¹⁷ which found benefits of involving a nurse practitioner and a general practitioner with the nephrology team for CKD patients but failed to describe how they were trained for the intervention. None of the articles mentioned beliefs and behaviors of the individuals involved, which may play an important role to the success of an intervention or not.

IMPLEMENTATION PROCESS

Of the five articles, only two included aspects of the implementation process. In Blakeman et al.,¹⁵ the authors specified that the guidebook they developed was completed with stage 3 CKD patients to make it more geared towards the participants of their study. This can be viewed as the investigators planning and considering their stakeholders for the implementation of their study. Additionally, of the 8 lay health workers, who would guide patients in the guidebook and community resources, only one was explicitly mentioned as being employed to oversee the telephone support. The other lay health workers' status as being volunteers or employees is unknown. However, it was mentioned that the lay health workers were trained in a 3-hour session by one of the authors. Training was also mentioned in Scherpbier-de Haan et al.,¹⁷ in which nurse practitioners and general practitioners of the intervention were trained by a nephrology team. Beyond these points, none of the papers discussed how their interventions were planned and even how their interventions were tailored to patients in either the introductions or the methods sections. Engagement was unclear as was fidelity. There was also no mention of re-

flecting or feedback during the implementation of the interventions. The wider implications are that authors are not gearing their papers to be easily replicated for future research nor for clinical practice.

DISCUSSION

The purpose of this paper was to highlight how CFIR can be used to understand barriers faced in MDC-CKD research design and publications. Limitations to this study are that data may have been misinterpreted from the methods of the investigation, and that a majority of the articles utilized from the umbrella reviews were not analyzed. As a systematized narrative review, analysis may be considered to be a biased and limited qualitative summary compared to systemic literature reviews, however, that is justified in order to provide readers examples and ideas of how to avoid CFIR barriers. One proposed limitation of this study is that papers from both Europe and the United States were utilized, though this is not believed to be a limitation due to the fact that the barriers outlined in CFIR are universal from a reader's point of view. The findings suggest that MDC-CKD research publications can suffer barriers of implementation that exist in all five domains of CFIR, and that MDC-CKD researchers may contribute to the barriers by publishing vague accounts of their implementation. Additionally, the lack of meaningful outcomes in MDC-CKD research may be due to the barriers researchers experience and contribute to in regards to either designing clinical interventions or attempting to repeat previous research that were too unclear to follow. Therefore, it is encouraged that MDC-CKD researchers utilize the CFIR framework in order to identify and amend barriers across the domains they encounter. Doing so could inform future MDC studies and encourage the exploration of implementation science components that have previously not been utilized in CKD treatment, which could help maximize the impact of MDC interventions.



This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CCBY-4.0). View this license's legal deed at <http://creativecommons.org/licenses/by/4.0> and legal code at <http://creativecommons.org/licenses/by/4.0/legalcode> for more information.

REFERENCES

1. Centers for Disease Control and Prevention. Chronic Kidney Disease Surveillance System—United States. <http://www.cdc.gov/ckd>
2. Fraser SDS, Roderick PJ, May CR, et al. The burden of comorbidity in people with chronic kidney disease stage 3: a cohort study. *BMC Nephrol.* 2015;16:193. doi:10.1186/s12882-015-0189-z
3. Sullivan MK, Rankin AJ, Jani BD, Mair FS, Mark PB. Associations between multimorbidity and adverse clinical outcomes in patients with chronic kidney disease: a systematic review and meta-analysis. *BMJ Open.* 2020;10(6):e038401. doi:10.1136/bmjopen-2020-038401
4. Webster AC, Nagler EV, Morton RL, Masson RL. Chronic kidney disease. *Lancet.* 2017;389(10075):1238-1252. doi:10.1016/S0140-6736(16)32064-5
5. MacRae C, Mercer SW, Guthrie B, Henderson D. Comorbidity in chronic kidney disease: a large cross-sectional study of prevalence in Scottish primary care. *Br J Gen Pract.* 2021;71(704):e243-e249. doi:10.3399/bjgp20x714125
6. Wang SM, Hsiao LC, Ting IW, et al. Multidisciplinary care in patients with chronic kidney disease: A systematic review and meta-analysis. *Eur J Intern Med.* 2015;26(8):640-645. doi:10.1016/j.ejim.2015.07.002
7. Galbraith L, Jacobs C, Hemmelgarn BR, Donald M, Manns B, Jun M. Chronic disease management interventions for people with chronic kidney disease in primary care: a systematic review and meta-analysis. *Nephrol Dial Transplant.* 2018;33(1):112-121. doi:10.1093/ndt/gfw359
8. Keith RE, Crosson JC, O'Malley AS, Crompton D, Taylor EF. Using the Consolidated Framework for Implementation Research (CFIR) to produce actionable findings: a rapid-cycle evaluation approach to improving implementation. *Implementation Sci.* 2017;12:15. doi:10.1186/s13012-017-0550-7
9. King DK, Shoup JA, Raebel MA, et al. Planning for Implementation Success Using RE-AIM and CFIR Frameworks: A Qualitative Study. *Front Public Health.* 2020;8:59. doi:10.3389/fpubh.2020.00059
10. Helou N, Dwyer A, Shaha M, Zanchi A. Multidisciplinary management of diabetic kidney disease: a systematic review and meta-analysis. *JBI Database System Rev Implement Rep.* 2016;14(7):169-207. doi:10.11124/jbisrir-2016-003011
11. Strand H, Parker D. Effects of multidisciplinary models of care for adult pre-dialysis patients with chronic kidney disease: a systematic review. *Int J Evid Based Healthc.* 2012;10(1):53-59. doi:10.1111/j.1744-1609.2012.00253.x
12. Tsang JY, Blakeman T, Hegarty J, Humphreys J, Harvey G. Understanding the implementation of interventions to improve the management of chronic kidney disease in primary care: a rapid realist review. *Implement Sci.* 2016;11:47. doi:10.1186/s13012-016-0413-7
13. Hemmelgarn BR, Manns BJ, Zhang J, et al. Association between multidisciplinary care and survival for elderly patients with chronic kidney disease. *J Am Soc Nephrol.* 2007;18(3):993-999. doi:10.1681/asn.2006080860
14. Patel HR, Pruchnicki MC, Hall LE. Assessment for Chronic Kidney Disease Service in High-Risk Patients at Community Health Clinics. *Ann Pharmacother.* 2005;39(1):22-27. doi:10.1345/aph.1e269
15. Blakeman T, Blickem C, Kennedy A, et al. Effect of information and telephone-guided access to community support for people with chronic kidney disease: randomised controlled trial. *PLoS One.* 2014;9(10):e109135. doi:10.1371/journal.pone.0109135
16. Barrett BJ, Garg AX, Goeree R, et al. A nurse-coordinated model of care versus usual care for stage 3/4 chronic kidney disease in the community: a randomized controlled trial. *Clin J Am Soc Nephrol.* 2011;6(6):1241-1247. doi:10.2215/cjn.07160810
17. Scherpbier-de Haan ND, Vervoort GMM, van Weel C, et al. Effect of shared care on blood pressure in patients with chronic kidney disease: a cluster randomised controlled trial. *Br J Gen Pract.* 2013;63(617):e798-e806. doi:10.3399/bjgp13x675386
18. Kutner NG. Improving compliance in dialysis patients: does anything work? *Semin Dial.* 2001;14(5):324-327. doi:10.1046/j.1525-139x.2001.00080.x