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Review

The Role of Team-Based Care Involving Pharmacists to Improve Cardiovascular and Renal Outcomes

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Collaboration · Team-based care · Cardiovascular outcomes · Renal outcomes · Pharmacist · Patient-Centered Medical Home · Medication Therapy Management

Abstract
The number of patients with cardiovascular and kidney disease in the United States continues to grow as the population ages, increasing the demand on the health care system and its providers. Many patients develop chronic conditions in which optimization of care is labor intensive, specifically hypertension, hyperlipidemia, diabetes, heart failure, and chronic kidney disease. Therefore, innovative and collaborative approaches to health care are warranted. Several team-based health care models have evolved and are gaining popularity, including the Patient-Centered Medical Home (PCMH) and Medication Therapy Management (MTM). Team-based care is widely supported in the literature, demonstrating significant improvement in cardiovascular and renal outcomes. This article will review the premises of PCMH and MTM, review the evidence and roles for team-based care specific to cardiovascular and renal outcomes, and introduce fundamentals to implement collaborative practice focusing on pharmacist-provider teams.

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Introduction

Heart disease and stroke account for the first and third leading causes of death, respectively, in the United States [1], resulting in more than USD 500 billion in health care costs in 2010 alone [2]. Additionally, 15.1% of the US population had chronic kidney disease (CKD) in 1999–2004 [3], with 25% of the Medicare budget being used to treat patients with CKD and end-stage renal disease (ESRD) as of 2006 [4]. Many of the risk factors for heart disease, stroke, and kidney disease can be modified to reduce mortality and health care costs, especially hypertension, hyperlipidemia, diabetes, and heart failure. However, traditional pharmacologic intervention has only led to modest reductions in cardiovascular and CKD risk, and additional strategies are needed to improve outcomes. Improved models of care using a team-based approach have been of interest in recent years, lending an opportunity to efficiently and effectively take care of a high volume of patients with chronic cardiovascular and renal diseases.

Health Care Models Involving Team-Based Care

The Patient-Centered Medical Home (PCMH) model is a team-based approach to health care that has risen to the forefront of model practices. The purpose of PCMH is to provide higher-quality health care at a reduced cost by placing the patient at the center of his or her care and replacing episodic care in favor of coordinated care with long-term provider-patient relationships. This model is endorsed by multiple organizations including the American Academy of Family Physicians, the American Academy of Pediatrics, the American College of Physicians, the American Osteopathic Association, and the American Medical Association. The principles of the PCMH model are that each patient has a personal physician that leads a team to take responsibility for the ongoing care of the patient at all stages of his or her life and arranges care as needed with other health care professionals. Care is coordinated across all elements of the health care system and is facilitated by registries, information technology, and health information exchange. Quality and safety are key principles endorsed by PCMH, which utilizes evidence-based medicine and clinical decision support tools to help guide therapy along with continuous quality improvement. Patients are viewed as active participants in their care, and access to care is enhanced through systems such as open scheduling and new options for communication. Additionally, payment is structured to recognize the added value of a PCMH [5]. The National Committee for Quality Assurance has developed standards and guidelines along with scoring systems to qualify as a PCMH. The six standard categories include enhancing access and continuity, identifying and managing patient populations, planning and managing care, providing self-care support and community resources, tracking and coordinating care, and measuring and improving performance. Table 1 summarizes the content of each standard [6].

Medication Therapy Management (MTM) is another team-based model that was developed in response to the Medicare Prescription Drug Improvement and Modernization Act of 2003, which created a Medicare Part D prescription drug benefit. Specifically, 'The (prescription drug plan) sponsor shall have a medication therapy management program, designed to pay pharmacists to counsel and otherwise assist enrollees with multiple chronic diseases (such as diabetes, asthma, hypertension, hyperlipidemia, and congestive heart failure, and kidney disease), multiple medications, and high cost drugs' [7]. Upon passage of this bill, eleven pharmacy organizations gathered together to form a consensus definition of MTM with the goal of optimizing therapeutic outcomes for patients. Specifically, these services may: (1) assess the patient's health status; (2) formulate medication treatment plans;

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Table 1. National Committee for Quality Assurance summary of PCMH standards [6]

Standard	Summary
Enhance access and continuity of care	Patient access to routine and urgent care during and after office hours including electronic access; Culturally and linguistically appropriate care is provided; Focus is on team-based care with trained staff; Patients can select a clinician
Identify and manage patient populations	Collection of demographic and clinical data by the practice for population management; Assessment and documentation of patient risk factors by the practice; Identification of practice and point-of-care reminders
Plan and manage care	Medication reconciliation at visits and after hospitalization; Use of e-prescribing; Care management focuses on pre-visit planning and working toward treatment goals; Identification of patients with high-risk care needs such as mental health and substance abuse problems
Provide self-care support and community resources	Assessment and development of patient/family self-care plans; Counseling on healthy behaviors; Provide or arrange mental health and substance abuse treatment
Track and coordinate care	Track, follow up, and coordinate tests and referrals; Follow-up of discharged patients
Measure and improve performance	Use of performance and patient data to continuously improve; Track measures such as hospitalization rates and ER visits; Identify vulnerable patient populations; Demonstrate improved performance as a practice

(3) select, initiate, modify, or administer medication therapy; (4) monitor and evaluate therapy for safety and efficacy; (5) perform a comprehensive medication review to identify, resolve, and prevent medication-related problems, including adverse events; (6) document care and communicate with the primary-care provider; (7) educate the patient regarding appropriate medication use; (8) enhance patient adherence, and (9) coordinate MTM services into the broader health care management services provided to the patient. MTM is meant to be patient specific and often involves face-to-face follow-up between the pharmacist and patient [8]. Settings for MTM services vary widely, including chain pharmacies, independent pharmacies, ambulatory-care clinics, acute-care inpatient, managed care, and federal pharmacies (Veterans Administrations, Department of Defense, public health services). Patients are identified as eligible and referred to MTM services by several parties, including health plans, pharmacists, physicians, and prescription benefit managers [9].

Pharmacist and Physician Collaborative Practice Agreements

Since PCMH and MTM encourage team-based care, collaborative practice agreements are an important component to integrate pharmacists into the teams in order to maximize their impact. Collaborative practice agreements may be written between a pharmacist and a pro-

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vider to allow expanded roles of the pharmacist such as initiating, modifying, and monitoring drug therapy, ordering or administering laboratory tests, and performing limited physical exams such as checking vital signs and assessing edema. Regulatory authority over collaborative practice agreements between pharmacists and physicians differs between each state, and federal institutions have their own regulations irrespective of the state. The 2011 Survey of Pharmacy Law from the National Association of Boards of Pharmacy was utilized to identify the number of states that allow the pharmacist to initiate, modify, and/or discontinue drug therapy pursuant to a collaborative practice agreement or protocol. The survey identified that, as of May 2011, 44 states formally allow collaborative practice agreements, with Missouri pending formal legislation and Maine only allowing collaboration for emergency contraception. The remaining 6 states (Alabama, Delaware, Illinois, Kansas, Oklahoma, and South Carolina) and Washington DC do not formally address collaborative practice in regulations, but it likely exists as noted by publications within these states in various journals [10, 11].

Federal institutions, especially the Veterans Administration, Indian Health Service, and Department of Defense, have a long-standing and progressive history of collaboration between pharmacists and physicians. By 1974, over 90% of the Indian Health Service sites had at least one pharmacist-run disease management program [12]. A recent survey of Indian Health Service physicians (n = 117) that sought to determine views of pharmacist effectiveness and impact on health care delivery found that 96% of respondents reported benefits, including 'improved disease management outcomes, increased return on investment, allowing the physician to shift their workload to more critical patients, (and) increased access to patient care' [11].

Evidence Supporting Improved Cardiovascular and Kidney Outcomes Utilizing Team-Based Care

As team-based care has evolved, so has the literature evaluating its impact on cardiovascular and kidney disease outcomes. The data is extensive and includes numerous trials with heterogeneous designs and meta-analyses. Much of the data integrates the management of hypertension, hyperlipidemia, diabetes, and heart failure, and there exists limited data regarding the management of CKD. Table 2 summarizes several outcomes from recent meta-analyses.

Hypertension, Hyperlipidemia, Diabetes, and Heart Failure

The literature typically compares team-based care to usual care on specific end points, most commonly blood pressure (BP) for hypertension, low-density lipoprotein (LDL) for hyperlipidemia, and hemoglobin A1C for diabetes. However, ESRD and all-cause mortality were evaluated in one prospective cohort study of patients with diabetic kidney disease, favoring a team-based approach over traditional care [13]. Outcomes for heart failure have included all-cause mortality and heart failure events along with hospitalization rates. The interventions of the pharmacists within the team-based care group vary but usually involve drug and disease state education with the patient, making treatment recommendations to the provider, increasing medication adherence, and/or managing medications for the disease states. The management of medications may involve the pharmacist starting, stopping, and adjusting medication through a collaborative practice agreement or protocol [14–16]. Most trials are conducted in primary-care clinics, although trials have also been carried out between pharmacists and cardiologists [17, 18] or diabetes specialists [13]. A meta-analysis on heart failure evaluated the role of the pharmacist in multidisciplinary care teams in both inpatient and outpatient settings [14]. Overall, the data has demonstrated improved outcomes

Table 2. Recent meta-analyses involving the effect of collaborative care teams including pharmacists on cardiovascular and renal outcomes

Ref.	Disease state	Number of trials (patient number) included in the meta-analysis	Cardiovascular and renal outcomes
14	Heart failure	12 randomized controlled trials (n = 2,060)	All-cause hospitalizations: odds ratio 0.71 (95% CI 0.54–0.94)[1]; Heart failure hospitalizations: odds ratio 0.69 (95% CI 0.51– 0.94)[1]
21	Hyper-lipidemia	7 randomized controlled trials (n = 924)	LDL weighted mean difference: –13.4 mg/dl (95% CI –23.0 to –3.8)[1]
21	Hyper-tension	19 randomized controlled trials (n = 10,479)	Systolic BP weighted mean difference: –8.1 mm Hg (95% CI –10.2 to –5.9)[1]
22	Diabetes	14 randomized controlled trials (n = 2,073)	Hemoglobin A1C weighted mean difference: –0.76% (95% CI –1.06 to –0.47)[1]; Fasting blood glucose weighted mean difference: –29.32 mg/dl (95% CI –39.54 to –19.10)[1]
29	CKD	8 controlled trials (n = 688 total: 47 transplants, 294 CKD, and 347 hemodialysis patients)	Mean all-cause hospitalizations (SD): 1.8 (2.4) vs. 3.1 (3.0), p = 0.02[1]; Incidence of ESRD or death in patients with diabetic nephropathy: 14.8 vs. 28.2 per 100 patient-years, adjusted relative risk 60%, p < 0.001[1]; Patients at goal hemoglobin: 69.8 vs. 43.9%, p < 0.0001[2]; Patients at goal transferrin saturation: 64.8 vs. 40.4%, p = 0.043[2]; Mean systolic BP (SD): 145.3 (16.8) vs. 175.8 (33.9) mm Hg, p = 0.029[2]; Mean calcium-phosphate product (SD): 4.43 (1.20) vs. 4.80 (0.51) mmol^2/l^2, p = 0.04[2]

[1] Outcomes which were reduced by team-based care versus usual care. [2] Managements which were improved by team-based care versus usual care.

using team-based care compared to usual care in reducing BP [19–21], lowering LDL [13, 15, 17, 21], and improving hemoglobin A1C [13, 16, 22]. For heart failure, all-cause mortality and heart failure events along with hospitalization rates were significantly reduced when utilizing team-based care [14, 18].

The literature involving collaboration in hypertension management has a long history dating back to 1973 when it has been shown that the addition of a pharmacist significantly reduced BP compared to a group not involving pharmacist care [23]. Since this first trial, the role of team-based care in hypertension management has continued to grow, and recently a state-of-the-art review was commissioned by the editorial board of the official journal of the American Society of Hypertension [24], supporting the role of team-based care in hypertension management. Additionally, a Cochrane Review in 2010 [25] evaluated 72 randomized controlled trials to determine the most effective interventions for reducing BP. One of the interventions evaluated was the use of nurse- or pharmacist-led care. The review concluded that this care model is promising since the majority of randomized controlled trials showed an improvement in BP control and mean systolic and diastolic BP. The authors concluded that an organized system of regular follow-up and use of vigorous stepped-care antihypertensive drug therapy is the most likely way to improve BP control.

The Asheville Project

One of the longest and largest studies regarding team-based care in hypertension and hyperlipidemia was the Asheville Project [26], which was a prospective cohort that followed

individuals for 6 years in a community setting that evaluated the clinical and economic outcomes of hypertension and dyslipidemia management. The pharmacists provided scheduled consultations, monitoring, and recommendations to the physicians based on national treatment guidelines. Of 565 patients evaluated for clinical outcomes, there were reductions in systolic BP and LDL to national guideline goals in approximately 27 and 24% of the population, respectively. Ultimately, the cardiovascular event rate declined by 39/1,000 person-years during the study on survival analysis. In evaluating the economic impact of 620 patients available for analysis, the mean cost per cardiovascular event was USD 9,931 compared to USD 14,343 prior to the study, and cardiovascular-related medical costs decreased by 46.5%.

Similarly, the Asheville Project cohort study [27] evaluated the persistence of clinical and economic outcomes for up to 5 years following the inception of a community pharmacy diabetes care program in twelve community pharmacies. The community pharmacists were trained in a diabetes certification program. The number of patients with A1C <7% increased at each follow-up visit. Additionally, the total mean direct medical costs decreased by USD 1,200 to USD 1,872 per patient per year compared to baseline. The Asheville Project emphasized the clinical and economic benefits of ongoing collaborative care.

Chronic Kidney Disease

There have been trials including CKD patients that demonstrate improvements when utilizing pharmacists to control hypertension, hyperlipidemia, diabetes, and secondary hyperparathyroidism. There has also been a lot of interest in anemia outcomes related to CKD utilizing team-based interventions [28–30]. A meta-analysis [29] reviewed the types of pharmacist interventions in the management of patients with CKD. The review identified 37 studies (n = 4,743 patients) with heterogeneous study designs and primary outcomes. Most of the pharmacist interventions involved medication profile reviews to address drug-related problems such as dosage adjustments related to renal function, making recommendations to the physicians, adjusting medications to optimize drug therapy, performing laboratory monitoring of specific parameters, and medication education. In a 2-year randomized controlled study [31] of patients undergoing hemodialysis, the intervention group involved in-depth one-on-one drug reviews with a pharmacist. This group compared to usual care contributed to a significant average reduction in all-cause hospitalizations.

How to Initiate a Physician-Pharmacist Collaboration

The literature strongly favors a collaborative care team in order to improve cardiovascular and kidney outcomes. In order to establish a multidisciplinary team, the first step is to reach out to your administration, pharmacy department, and/or local school of pharmacy to gauge interest and discuss collaborative practice laws within your state or federal system. If none of these options exist in your practice setting, speaking to the state board of pharmacy or a community pharmacist in which you have established a good rapport might be beneficial. Pharmacists, like physicians, tend to develop specific clinical skills and strengths pursuant to their practice setting and experiences. Therefore, it is important to have open communication regarding your vision of the position and the types of disease states that will be encountered in your practice setting. Another important step is establishing a scope of practice or collaborative practice agreement keeping in mind state and federal laws for both the physician and pharmacist. Typically, the pharmacist and provider or administration can write this 1–2-page document together in order to outline the responsibilities of the pharmacist.

As seen in the literature, the role of the collaborative care team pharmacist can vary significantly from making medication recommendations to the provider to managing specific disease states upon provider referral either with or without protocols. Regardless of the role, the evidence-based improvement in cardiovascular and renal outcomes along with the additional follow-up that the patient will receive is well worth the pursuit of team-based care.

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