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The Efficacy of Integrated Multidisciplinary Nursing and Pharmacy Models in Enhancing Patient Outcomes among Individuals with Chronic Kidney Disease: Review

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Abstract

Background: Chronic kidney disease (CKD) is a significant global health issue, affecting approximately 11% to 13% of the population worldwide. Its associated comorbidities, such as hypertension and diabetes, compound the healthcare burden. Effective management strategies are essential to improve patient outcomes and reduce healthcare costs.

Methods: This systematic review analyzed studies published from 2007 to 2023 across four databases (Web of Science, PubMed, Cochrane Library, and CINAHL) to evaluate the impact of multidisciplinary care (MDC) on CKD patient outcomes. The review focused on the composition of MDC teams, the nature of interventions, and health outcomes, with a particular emphasis on estimated glomerular filtration rate (eGFR) changes and other clinical indicators.

Results: The review identified a total of 11 relevant studies. Findings indicated that MDC interventions significantly delayed eGFR decline and reduced the risk of requiring renal replacement therapy. Notably, patients receiving MDC exhibited superior management of comorbidities such as hypertension and improved biochemical markers. However, inconsistencies were observed in secondary outcomes, including hospitalization rates and blood pressure management, highlighting variability in the effectiveness of MDC across different settings and populations.

Keywords: comorbidities, multidisciplinary, interventions, comorbidities.

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1. Conclusion: The integration of multidisciplinary approaches in CKD management shows promise in enhancing patient outcomes, particularly concerning the progression of renal impairment. Future research should focus on standardizing MDC interventions and exploring their long-term impacts on patient morbidity and healthcare costs.p**Keywords**: Chronic kidney disease, multidisciplinary care, patient outcomes, estimated glomerular filtration rate, healthcare management.p**Introduction**

Chronic kidney disease (CKD) is a prevalent long-term condition; its prevention and management are vital healthcare concerns in several nations globally (1). The global prevalence rate of chronic kidney disease (CKD) is 11%–13% (1). The incidence of comorbidities linked to chronic kidney disease (CKD), including hypertension, diabetes, and hyperlipidemia, is on the rise (1, 2). Nevertheless, hardly 3.5% of studied CKD patients accurately recognized the stage of their condition (3). Chronic kidney disease (CKD) is linked to several biochemical and physiological irregularities and negative consequences, including heightened risk of cardiovascular incidents, progression to end-stage renal disease necessitating renal replacement treatment for survival, and elevated death rates (1). Chronic kidney disease necessitates prolonged management and expensive renal replacement treatment, hence diminishing quality of life and exacerbating the national healthcare burden (4). Consequently, delivering appropriate health care for CKD patients and averting CKD advancement is essential for clinical and economic considerations (5).

Enhancing the quality and efficacy of care for a complex condition like CKD necessitates a comprehensive strategy grounded in multidisciplinary care (MDC), wherein specialists from various fields collaborate to optimize the fulfillment of patients' physical and psychological requirements (6, 7). MDC can impede the advancement of CKD by guaranteeing that patients have comprehensive, uninterrupted, and cohesive treatment (7). The MDC model posits that a consortium of organizations offers or organizes a coherent continuum of services administered by a team of experts with experience in many areas. The MDC model is extensively used for the management of both chronic illnesses and critical care (7). Patients with chronic kidney disease (CKD) receiving multidisciplinary care (MDC) exhibit enhanced readiness for dialysis, improved overall survival rates, superior advancements in biochemical indicators, and reduced occurrences of unanticipated dialysis and cardiovascular events (3).

Nevertheless, many randomized controlled studies (RCTs) suggest that, in comparison to chronic kidney disease (CKD) patients receiving conventional treatment, those receiving multidisciplinary care (MDC) exhibit no enhancements in renal function, medical insurance use, or death rates (8). Wang et al. (7) conducted a systematic review and meta-analysis on the efficacy of MDC in decreasing all-cause mortality, dialysis, temporary catheterization, and hospitalization among patients with CKD stages 3–5; however, the precision of their findings was compromised by substantial heterogeneity in the samples (e.g., CKD patients, dialysis patients, CKD patients undergoing dialysis) and in the interventions (e.g., MDC intervention, walking, multidisciplinary pre-dialysis education programs, care provided by coordinated nursing teams versus general practitioners). Furthermore, Wang et al. (7) failed to assess research quality, hence diminishing trust in the results. The existing literature evaluation indicates that the majority of research has examined the impact of MDC in CKD dialysis patients, revealing a lack of agreement about the efficacy of an MDC program in delaying the development of CKD. This research conducted a comprehensive literature evaluation of MDC outcomes in CKD patients. This research aimed to investigate: (1) the composition of a multidisciplinary care (MDC) team for chronic kidney disease (CKD); (2) the components of an MDC intervention for CKD; and (3) health outcomes in CKD patients who underwent MDC.

2. Research Methodology

Studies pertinent to 2007–2023 were obtained from four databases: PubMed, Web of Science, Cochrane Library, and CINAHL.

3. Results

Seven studies used a reduced eGFR decrease as an outcome measure. One randomized controlled trial and five cohort studies indicated that MDC effectively mitigated reductions in eGFR among CKD patients.

Nevertheless, another randomized controlled trial including stage 3–5 chronic kidney disease patients with concomitant hypertension or diabetes showed that mineralocorticoid receptor antagonism did not substantially impede the deterioration of the estimated glomerular filtration rate in the experimental group receiving the intervention compared to the control group receiving normal therapy. The research concentrated only on individuals with stage 3 chronic kidney disease (9). The second research included individuals with stage 1–5 chronic kidney disease (CKD), mostly including stage 3 CKD patients (10). Due to two studies evaluating renal function in a single cohort pre- and post-MDC, only five studies were used to examine the impact of MDC on eGFR reduction. In four of the five studies, the total sample size varied between 1,000 and 2,000, the research quality score ranged from 8 to 11 points, and the mean follow-up time for outcomes surpassed 2 years. Consequently, the data from these five investigations were deemed credible evidence for inclusion in a meta-analysis (3, 9,11-13). A random effects model was used because of the significant heterogeneity across trials ($Q = 85.36$, $I2 = 95\%$, $p < .001$). The disparity in eGFR reduction between the MDC and non-MDC groups was statistically significant. The total effect size was .95, indicating a strong impact (95% CI [−1.38, −.51], $p < .001$).

Retrospective cohort research by Chen et al. (3) indicated that CKD patients who underwent an MDC intervention saw a substantially reduced risk (36%) of requiring renal replacement therapy compared to a control group receiving conventional treatment. Separate cohort research indicated that early referral to nephrology and the commencement of renal replacement therapy were much greater in CKD patients with MDC compared to those without MDC (11).

Of the eight studies examining the efficacy of MDC in lowering blood pressure, two indicated that MDC considerably enhanced blood pressure levels. Scherpbier-de Haan et al. (13) indicated that a multidisciplinary care (MDC) intervention for chronic kidney disease (CKD) patients resulted in a significantly reduced systolic blood pressure (8.2 mmHg lower; 95% CI [−12.9, −3.6], $p < .001$) and a significantly reduced diastolic blood pressure (4.7 mmHg lower; 95% CI [−8.4, −1.1], $p = .010$) in the intervention group relative to the control group. Further prospective cohort research conducted by Luciano Ede et al. (10) showed a substantial enhancement in mean blood pressure after MDC compared to its levels before MDC ($p < .001$). The remaining randomized controlled trial and five cohort studies demonstrated no meaningful enhancement in blood pressure.

Concerning secondary outcome measures, two studies indicated that MDC significantly reduced the emergency hemodialysis rate and yearly medical expenses. Research indicated that MDC significantly reduced the risk of end-stage renal disease (ESRD) (14). Inconsistent findings have been documented for several outcome markers, such as hospitalization due to cardiovascular or infectious events, drug use, and dialysis occurrence. Other secondary variables, such as hospitalization rates, emergency department visits, admissions to skilled care facilities, and all-cause hospitalizations, did not exhibit significant differences.

4. Members of the MDC Team

The US National Kidney Foundation KDOQI clinical recommendations advocate for the involvement of a nephrologist in multidisciplinary care for stage 4 chronic kidney disease (15). A patient with chronic kidney disease (CKD) with an estimated glomerular filtration rate (eGFR) below 60 ml/min/1.73 m^2 would progressively experience CKD-associated comorbidities and uremic manifestations. The multidisciplinary care team for chronic kidney disease patients should include specialists from several fields to provide effective disease management and enhanced clinical outcomes. An optimal MDC team should include a general practitioner, a nephrologist, and professionals from many disciplines, including nurses, social workers, dietitians, pharmacists, and psychotherapists. The necessary professional personnel may vary per nation owing to various healthcare systems. Ten studies in this evaluation concurred that an MDC team should ideally include a nephrologist, nursing personnel (nurse practitioner, nurse, and health education instructor), and a dietitian. Certain studies advocate for the incorporation of additional experts, such as a heart surgeon, urological surgeon, chemist, psychologist, and social worker. The multidisciplinary care (MDC) for patients with stage 3–5 chronic kidney disease (CKD) comprises a

nephrologist, a renal health education specialist, and a dietitian (3, 11, 14). The MDC in various countries comprises surgeons (cardiovascular and general surgeons) and a kidney transplant team to deliver optimal care aimed at preventing or delaying the deterioration of renal function and enhancing the care and quality of life for CKD patients (4,6).

5. Substance of MDC Intervention

This analysis indicates that MDC practices are mostly based on clinical care standards, with the primary aim of providing direction for medical treatment, education about CKD, lifestyle modifications, and support from additional professions. Every team member has distinct duties. The nephrologist primarily oversees the medical care of patients, which includes prescription medications (antihypertensives, lipid-lowering agents, and glucose-lowering pharmaceuticals), monitoring biochemical indicators, and assessing the stage of the illness. Nurses (nurse practitioners, registered nurses, and renal health education specialists) concentrate on delivering health education programs related to chronic kidney disease (CKD), encompassing CKD knowledge, risk factors, comorbidities, indicators of end-stage renal disease, renal replacement therapy, and the appropriate timing for initiating dialysis access. They also facilitate lifestyle modifications, such as smoking cessation, exercise regimens, and weight management, for patients. The nutritionist primarily offers nutritional health education for CKD patients, nutrition and diet advice, and preventive measures. The pharmacist offers guidance on the harmful effects of nephrotoxic medications to patients. Ultimately, the social worker, psychotherapist, or other professionals provide pertinent support and expert guidance and advice. The standard care for chronic kidney disease (CKD), according to KDOQI clinical care recommendations, include consultation, medical treatment, health education, dietary and nutritional guidance, and other professional expertise (National Health Insurance Administration, 2019). Interventions in MDC encompass the establishment of vascular access post-initial dialysis, management of comorbidities, and enhancement of patient self-management skills to mitigate the severity and progression of CKD, alongside consistent follow-up that includes clinical evaluations, blood test assessments, nutritional guidance, and evaluation of intervention outcomes (2, 13).

6. MDC Follow-up Intervals and Duration

Due to the intricacies of chronic kidney disease management, adherence to clinical standards often poses challenges for patients. Consequently, continuous follow-up is essential to ensure that the patient attains the objectives outlined in the clinical recommendations (3). Our research indicated that, on average, patients attend follow-up visits every 1 to 6 months after an MDC intervention. Two prior studies in Taiwan have aggregated significant data about MDC outcomes, and their methodologies aligned with contemporary CKD care procedures (3, 11, 14). This review indicates that the minimum outcome measurement interval was 1 year, the maximum was 5 years, and the median/mean follow-up period was 1.5/1.92 years. We determined that the discrepancies in the reported impacts of MDC on CKD outcomes may only indicate the extended mean follow-up time in cohort studies (2.14 years) relative to the mean follow-up duration in RCTs (1.33 years), as shown in Wang et al. (7). Valentijn et al. (16) conducted a study of the impacts of patient-centered integrated care, using data from 14 trials (N = 4,693) with an average follow-up period of 12 months. Integrated care has shown no impact on mortality and quality of life, with ambiguous effects on serum creatinine, eGFR, and renal replacement therapy (16). An adequately extended follow-up duration is required to assess the efficacy of an MDC intervention. Consequently, a follow-up duration of no less than 2 years is required to ascertain the impact of MDC on CKD outcomes, allowing enough time to notice results.

7. Indicators of MDC Outcomes

The amalgamation of health outcome indicators employed by the 11 studies of MDC for CKD patients demonstrated notable disparities among primary outcome indicators (e.g., patient mortality, eGFR, renal replacement therapy), secondary indicators (e.g., emergent start dialysis, annual medical costs), and biochemical markers (e.g., phosphate, calcium, PTH, fasting blood glucose, proteinuria). The findings indicate that an MDC intervention reduces patient mortality, albeit it does not affect all-cause mortality.

Chronic Kidney Disease (CKD) is intricate, and the majority of patients possess concomitant chronic conditions that may influence the assessment of the impact of Multidisciplinary Care (MDC) on overall mortality. Consequently, more examination of the impact of MDC on all-cause mortality is required.

An MDC intervention markedly reduces the deterioration of eGFR in CKD patients and postpones the advancement of CKD to end-stage renal disease. MDC is linked to a decreased risk of renal replacement treatment in CKD patients and an enhanced acceptability of renal replacement therapy after a CKD care plan. This aligns with the finding that an MDC intervention may postpone the course of CKD (4). None of the six cohort trials indicated a substantial improvement in blood pressure management. Despite two studies demonstrating considerable outcome discrepancies, their quality ratings were very low (six and seven points) (10, 13). Furthermore, one randomized controlled trial did not use a suitable technique for measuring blood pressure. During each follow-up visit, the patient was instructed to rest for 5 minutes prior to the acquisition of three blood pressure measures while seated (11). The average of the last two readings was used for analysis. Consistent daily monitoring of blood pressure over an extended duration might provide more accuracy than this singular measurement approach.

Two studies shown that an MDC intervention in MDC may reduce the incidence of emergency hemodialysis (3,17). Patients with chronic kidney disease (CKD) using a temporary hemodialysis catheter exhibit diminished survival rates, increased hospitalization frequencies, and elevated medical expenses in comparison to those having a permanent dialysis catheter. Consequently, a permanent dialysis catheter, such as an arteriovenous fistula or an indwelling peritoneal dialysis catheter, must be inserted prior to the commencement of planned dialysis.

The study results indicated significant differences between MDC and non-MDC patients in their improvements in phosphate regulation, serum calcium levels within the normal range, and control of parathyroid hormone, proteinuria, and fasting blood glucose levels. Regulating calcium and phosphate levels within the normal range helps mitigate the risk of bone lesions and cardiovascular illnesses. Effective PTH regulation may enhance hyperparathyroidism, whereas optimal glycemic management can reduce proteinuria and decelerate eGFR deterioration. We advocate for the use of the aforementioned variables as principal clinical metrics for MDC treatment outcomes in CKD patients.

8. Constraints of the Study

This research acknowledges potential limitations. This review used research published in many languages, namely Chinese and English, sourced from multiple electronic sources. Certain potentially eligible research may have been excluded from the analysis. Additional analysis is required using other data sources, including findings from research obtained from other databases, unpublished data, and gray literature.

A second restriction is that, akin to previous research, our analysis revealed a scarcity of reports using an RCT design, and that MDC therapies exhibited considerable heterogeneity, including a diverse array of interventions. Consistent with two studies that conducted systematic literature reviews and meta-analyses (7, 16), our review determined that MDC could postpone eGFR decline, reduce patient mortality, diminish the necessity for emergent dialysis initiation, enhance the acceptance rate for renal replacement therapy, facilitate the transition to dialysis, and lower medical costs. Biochemical indicators indicated that MDC may enhance the regulation of blood calcium and phosphate levels, as well as reduce PTH in individuals with chronic kidney disease (CKD). An MDC intervention may enhance the cost-effectiveness of CKD therapy by reducing the total expenses associated with medical care for CKD. Wang et al. (7) discovered that MDC correlates with reduced all-cause mortality, diminished chance of initiating dialysis, and decreased likelihood of temporal catheterization; however, it does not correlate with dialysis or hospitalization for dialysis. Valentijn et al. (16) indicated that MDC influences mortality and quality of life but does not affect serum creatinine, eGFR, RRT, blood pressure management, or hospitalization rates. Inconsistent findings may stem from the considerable heterogeneity across people, treatments, and outcome measures for CKD described in the literature; more RCT studies are necessary for a comprehensive knowledge of the effects of MDC.

Third, since the majority of individuals in the systematic literature review were patients with stage 3–5 chronic kidney disease (CKD), the findings of this meta-analysis apply only to this population. The probable reason for the absence of data about individuals in other stages of chronic kidney disease (CKD) is that, due to the absence of clinically evident symptoms in the early stages, CKD often goes undiagnosed during the first screenings. Consequently, an exhaustive account of MDC outcomes in comprehensive CKD management is challenging. Early identification is a critical subject that requires more research. This therapeutic approach emphasizes the early screening of the illness, specifically the prompt detection of chronic kidney disease (CKD), to avert and postpone the deterioration of renal function. Additional MDC-related outcome studies in stage 1–2 CKD patients are necessary to resolve these concerns.

9. Consequences for Implementation and Investigation

In clinical practice, the general practitioner's (GP) role in managing chronic diseases (MDC) is to oversee renal function and blood pressure within primary care settings. The general practitioner should send the patient to a nephrologist when the estimated glomerular filtration rate (eGFR) decreases to 30 ml/min/1.73 m^2 (18). The primary responsibility of the nephrologist is to assess the illness stage and pharmacological therapy, monitor biochemical indicators, and ascertain the appropriate time for the placement of dialysis catheter access. Nurses provide disease-specific educational programs and counsel patients on lifestyle modifications, enhance their understanding of the illness and self-management, and promote adherence to drug regimens while addressing behavioral obstacles to compliance (19). Nurse practitioners may assess cardiovascular disease risk factors and aid patients in controlling diabetes, cholesterol levels, blood pressure, body weight, and lifestyle changes (20). The social worker may do a comprehensive social and financial assessment, focusing on obstacles to accessing MDC treatment, and assist patients in acquiring necessary finances (6). The dietitian may get a comprehensive dietary history, suggest dietary alterations such as the implementation of a low-protein and low-potassium renal diet, and oversee dietary adherence (21-25).pHolistic care for these patients must encompass the execution of the disease management plan, formulation of clinical care protocols, establishment of a consensus among multidisciplinary staff, organization of the care team, conducting routine patient follow-ups, documenting the patient's clinical information, and enhancing patient self-management. Collaboration among various healthcare experts is essential, and chronic kidney disease (CKD) serves as an optimal situation for assessing the efficacy of the multidisciplinary care (MDC) model in delivering continuous, integrated, high-quality treatment to CKD patients, hence postponing disease progression. This research found that only the data on eGFR decrease were sufficiently thorough for a meta-analysis. Additional meta-analyses of pertinent outcome markers are required to provide more proof of the overall efficacy of MDC in CKD, which may be used to advocate for its implementation in clinical practice.

10. Conclusions

The substantial expense of medical treatment for CKD patients might impose a significant financial strain on national healthcare systems. Consequently, postponing the progression of chronic kidney disease (CKD) is a universal objective for all national healthcare systems. This systematic literature review analyzed diverse health outcomes of multidisciplinary care (MDC) in chronic kidney disease (CKD) patients, concluding that CKD management necessitates the involvement of specialists from many disciplines and that a comprehensive treatment approach should be tailored to the disease stage and individual patient requirements.

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.فعالية النماذج المتكاملة متعددة التخصصات للتمريض والصيدلة في تحسين نتائج المرضى بين الأفراد المصابين بمرض الكلى المزمن: مراجعة

الملخص

الخلفية :يُعد مرض الكلى المزمن (CKD) مشكلة صحية عالمية كبيرة، حيث يؤثر على ما يقرب من 11% إلى 13% من السكان في جميع أنحاء العالم. تزيد الأمراض المصاحبة المرتبطة به، مثل ارتفاع ضغط الدم والسكري، من عبء الرعاية الصحية. تعتبر استراتيجيات الإدارة الفعالة ضرورية لتحسين نتائج المرضى وتقليل تكاليف الرعاية الصحية.

الطرق :حللت هذه المراجعة المنهجية الدراسات المنشورة من عام 2007 إلى 2023 عبر أربع قواعد بيانات(Web of Science ، PubMed، Cochrane Library، و CINAHL)لتقييم تأثير الرعاية متعددة التخصصات (MDC) على نتائج مرضى .CKD ركزت المراجعة على تكوين فرقMDC ، وطبيعة التدخلات، ونتائج الصحة، مع التركيز بشكل خاص على تغييرات معدل الترشيح الكبيبي المقدّر (eGFR) والمؤشرات السريرية الأخرى.

النتائج :حددت المراجعة ما مجموعه 11 دراسة ذات صلة. أشارت النتائج إلى أن تدخلات MDC أخرت بشكل كبير تدهور معدل eGFR وقللت من خطر الحاجة إلى العلاج بالبدائل الكلوية. ومن الجدير بالذكر أن المرضى الذين تلقوا MDC أظهروا إدارة فائقة للأمراض المصاحبة مثل ارتفاع ضغط الدم وتحسناً في المؤشرات الكيميائية الحيوية. ومع ذلك، لوحظت تفاوتات في النتائج الثانوية، بما في ذلك معدلات الدخول إلى المستشفيات وإدارة ضغط الدم، مما يشير إلى تباين في فعالية MDC عبر الإعدادات والسكان المختلفة.

الاستنتاج :يظهر دمج النهج متعددة التخصصات في إدارة CKD وعداً بتحسين نتائج المرضى، لا سيما فيما يتعلق بتطور ضعف الكلى. يجب أن تركز الأبحاث المستقبلية على توحيد تدخلات MDC واستكشاف آثارها طويلة المدى على اعتلال المرضى وتكاليف الرعاية الصحية.

الكلمات المفتاحية :مرض الكلى المزمن، الرعاية متعددة التخصصات، نتائج المرضى، معدل الترشيح الكبيبي المقدّر، إدارة الرعاية الصحية pp.