Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 3527 – 3537
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.5021

A Systematic Review of Examining the Significance and Functions of Clinical Pharmacy Services for Patients with Chronic Kidney Disease

Adel Mohmmed Ghuffah[1], Mazen Mohammed Hendi[2], Osama Abdu Ebrahim[3], Abulaziz Dhaifallah Fakher[4], Ali Yahya Jeli[5], Ibrahim Mohammed Dighriri[6], Samah Saeed AL-Ghamdi[7], Hamad Hamdan Alnomani[8], Mohammad Said Alyuhyuwa[9], Ahmed Mouhammed Alghamdi[10], Naif Olaythah Alharbi[11], Ahmad Mohammad Algohani[12], Hattan Smer Mashat[13], Yahya Hassan Al-Mesha'ee[14], Saeed Ali Alqahtani[15], Aqeel Muhyi Albariqi[16], Ahmad Ali Dighriri[17]

Abstract

Clinical pharmacy services (CPS) are essential for individuals with chronic kidney disease (CKD) not only to reduce morbidity and mortality but also to alleviate the economic burden. A systematic review was conducted to evaluate the impact of CPS on adult patients with CKD. This review examined randomized controlled trials (RCTs) published between 2013 and 2023, sourced from PubMed, Web of Science, and Scopus databases. The Cochrane Risk of Bias Tool 2.0 was employed to assess the quality of these studies. Five studies involving 2,738 patients with CKD at various stages indicated that CPS roles encompassed medication review, patient education, and collaboration with physicians. Furthermore, CPS facilitated improved medication reconciliation, safety, and quality of life (QoL). Clinical outcomes varied across studies; some reported improvements in interdialytic weight gain, blood pressure control, and hemoglobin levels, whereas others showed no significant difference in blood pressure management. The inconsistent results across studies highlight the need for additional research to enhance these interventions and assess their long-term effects on CKD management. However, the potential of CPS to reduce expenses in CKD management is a promising aspect that cannot be overlooked.

Keywords: *Renal Impairment, Pharmaceutical Care, Drug Therapy Optimization, Pharmacist-Led Interventions.*

Introduction

Chronic kidney disease (CKD) is one of the most significant global health challenges in the 21st century, affecting approximately 10-15% of the adult population worldwide (1). The prevalence of this condition has shown an upward trend, with recent epidemiological studies indicating substantial variations across different regions and populations (2). This increasing prevalence, coupled with the condition's progressive nature, has created an unprecedented burden on global healthcare systems. The economic impact is

[1] Department of Pharmacy, Armed Forces Hospital, Jazan, Saudi Arabia.
[2] Department of Pharmacy, Armed Forces Hospital, Jazan, Saudi Arabia.
[3] Department of Pharmacy, Armed Forces Hospital, Jazan, Saudi Arabia.
[4] Department of Pharmacy, Armed Forces Hospital, Jazan, Saudi Arabia.
[5] Department of Pharmacy, Armed Forces Hospital, Jazan, Saudi Arabia
[6] Department of Pharmacy, King Abdulaziz Specialist Hospital, Taif, Saudi Arabia
[7] Department of Pharmacy, Jubail General Hospital, Saudi Arabia
[8] Department of Pharmacy, King Abdulaziz Hospital, Makkah, Saudi Arabia
[9] Department of Pharmacy, King Abdulaziz Hospital, Makkah, Saudi Arabia
[10] Department of Pharmacy, King Abdulaziz Hospital, Makkah, Saudi Arabia
[11] Department of Pharmacy, King Abdulaziz Hospital, Makkah, Saudi Arabia
[12] Department of Pharmacy, King Abdulaziz Hospital, Makkah, Saudi Arabia
[13] Department of Pharmacy, King Abdulaziz Hospital, Makkah, Saudi Arabia
[14] Department of Pharmacy, Maternity and Children Hospital, Abha, Saudi Arabia
[15] Department of Pharmacy, Aseer Central Hospital, Abha, Saudi Arabia
[16] Department of Pharmacy, Bariq Primary Health Care Center, Bariq, Saudi Arabia
[17] Department of Pharmacy, Armed Forces Hospital, Jazan, Saudi Arabia.

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 3527 – 3537
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.5021

particularly striking in developed nations, with annual costs exceeding $87 billion in the United States alone, which continues to grow as the population ages and comorbidity patterns evolve (1,2).

CKD management presents unique challenges that extend beyond the primary disease process. Patients with CKD must navigate complex therapeutic regimens that frequently require careful adjustment and monitoring. The risk of adverse drug reactions is exceptionally high in this population, primarily due to the altered pharmacokinetics and pharmacodynamics associated with declining renal function (3). This complexity is further magnified by the high prevalence of comorbid conditions, with studies indicating that over 60% of patients with CKD manage at least three concurrent chronic conditions, most commonly diabetes, hypertension, and cardiovascular disease. The interplay between these conditions and their respective treatment requirements creates an intricate web of therapeutic considerations that requires specialized pharmaceutical oversight (2,3).

Clinical pharmacy services (CPS) have emerged as a crucial component in the comprehensive management of chronic diseases, offering specialized expertise in medication therapy management and patient care optimization. These services encompass various interventions, including systematic medication evaluations, therapeutic drug monitoring, patient education, and inter-professional collaboration (4,5). The integration of clinical pharmacists into multidisciplinary healthcare teams has demonstrated substantial benefits across various chronic conditions with particularly promising outcomes in CKD management. Contemporary research has highlighted the significant impact of pharmacist-led interventions on critical aspects of CKD care, including the enhanced management of anemia, improved blood pressure control, and better medication adherence patterns (6). Furthermore, when clinical pharmacists assume leadership roles in medication therapy management programs for CKD patients, studies have documented notable improvements in adherence to evidence-based treatment guidelines and patients' quality of life (QoL) metrics (7).

The intricate nature of CKD management presents distinctive opportunities for clinical pharmacists to leverage their specialized expertise. Within the CKD care framework, clinical pharmacists serve as medication therapy experts, actively engaging in comprehensive medication management, precise dosage adjustments based on dynamic kidney function parameters, and systematic identification and prevention of drug-related problems. Their scope extends to delivering targeted patient education, facilitating seamless collaboration within healthcare teams, and contributing to effective monitoring and management of concurrent medical conditions. As part of the multidisciplinary healthcare team, clinical pharmacists bring a unique perspective and skill set to the table, enhancing the overall quality of care for CKD patients. This multifaceted role positions clinical pharmacists as essential members of the CKD care team, particularly in addressing the complex medication-related needs of this vulnerable patient population (4,5,6).

Despite the apparent advantages of integrating CPS into CKD management protocols, there remains a critical need for comprehensive evaluation of their effectiveness across diverse healthcare settings and patient populations. While existing literature has explored specific aspects of pharmaceutical care in CKD management, there is a notable gap in systematic analyses of randomized controlled trials examining CPS's broader impact on CKD patient outcomes. Previous reviews have primarily focused on isolated aspects of pharmaceutical care, leaving questions regarding the comprehensive effect of CPS on the multifaceted challenges of CKD management largely unanswered (6,7).

This systematic review aimed to address this gap by comprehensively collecting and analyzing evidence regarding the significance and function of CPS in adult patients with CKD. The primary objective was to thoroughly evaluate the existing research on the impact of CPS on drug-related and clinical outcomes. Additionally, this review examined various service delivery models and their relative effectiveness across different healthcare settings, providing insights into the optimal implementation strategies for CPS in CKD care. Understanding these aspects is crucial for developing evidence-based recommendations for integrating CPS into comprehensive CKD management programs (4,5,6,7).

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 3527 – 3537
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.5021

Methods

Study Design

This systematic review adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 statement, ensuring comprehensive and transparent reporting of the methods and findings (4). Before initiating the study, a detailed protocol was developed to establish standardized literature identification, screening, data extraction, and synthesis procedures.

Search Strategy and Information Sources

A systematic literature search was conducted using three major electronic databases: PubMed, Web of Science, and Scopus. The search strategy employed a combination of Medical Subject Headings (MeSH) terms and relevant keywords organized according to the PICOS framework. The primary search strings included terms related to the population ("chronic kidney disease" OR "CKD" OR "Renal Insufficiency"), intervention ("Clinical Pharmacy Services" OR "Pharmaceutical Services" OR "Pharmacist Interventions"), and outcomes ("Patient Outcomes" OR "Medication Management" OR "Quality of Care"). Additional filters were applied to restrict the search to randomized controlled trials published between 2013 and 2023. The search strategy was pilot-tested and refined to optimize its sensitivity and specificity in identifying relevant studies (4,5).

Study Selection Process

The study selection process focused on randomized controlled trials investigating CPS in CKD management. Studies were eligible if they included adult patients (aged ≥18 years) with any stage of CKD, evaluated CPS, and reported relevant clinical or patient-centered outcomes. The exclusion criteria were pediatric studies, non-randomized designs, conference abstracts, and publications in languages other than English. Two independent reviewers screened titles and abstracts, followed by a full-text assessment of potentially eligible studies using the Covidence Systematic Review Management tool. Disagreements were resolved through discussion or consultation with a third reviewer when necessary (5,6).

Quality Assessment

The methodological quality of the included studies was evaluated using the Cochrane Risk of Bias Tool 2.0. This assessment examined five key domains: the randomization process, deviations from intended interventions, missing outcome data, outcome measurements, and selective reporting. Each domain was categorized as having a low risk, some concerns, or a high risk of bias. Two reviewers conducted The assessment independently, and discrepancies were resolved through consensus discussions. This rigorous approach to quality assessment enables a comprehensive understanding of the reliability and validity of the evidence (6).

Data Extraction and Synthesis

A standardized data extraction form was developed and piloted to ensure consistent collection of relevant information. The extracted data included study characteristics (author, year, country, and setting), participant demographics, intervention details (type, duration, and frequency), control group conditions, and outcome measures. Particular attention was paid to documenting the components of the CPS and their implementation strategies. The extracted data were organized systematically to facilitate comparisons across studies and enable a comprehensive analysis of intervention effectiveness. Given the heterogeneity in intervention types and outcome measures across the studies, a narrative synthesis approach was adopted to integrate the findings. This synthesis focuses on identifying CPS's effectiveness patterns across different healthcare settings and patient populations (5,6).

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 3527 – 3537
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.5021

Statistical Analysis

A meta-analysis was not deemed appropriate because of the considerable heterogeneity in intervention types, outcome measures, and reporting methods across the included studies. Instead, the results were synthesized narratively, with effect sizes and statistical significance reported, as documented in the original studies. Where possible, comparative analyses were conducted to examine the relative effectiveness of different types of CPS and their impact on various outcome measures (5,6).

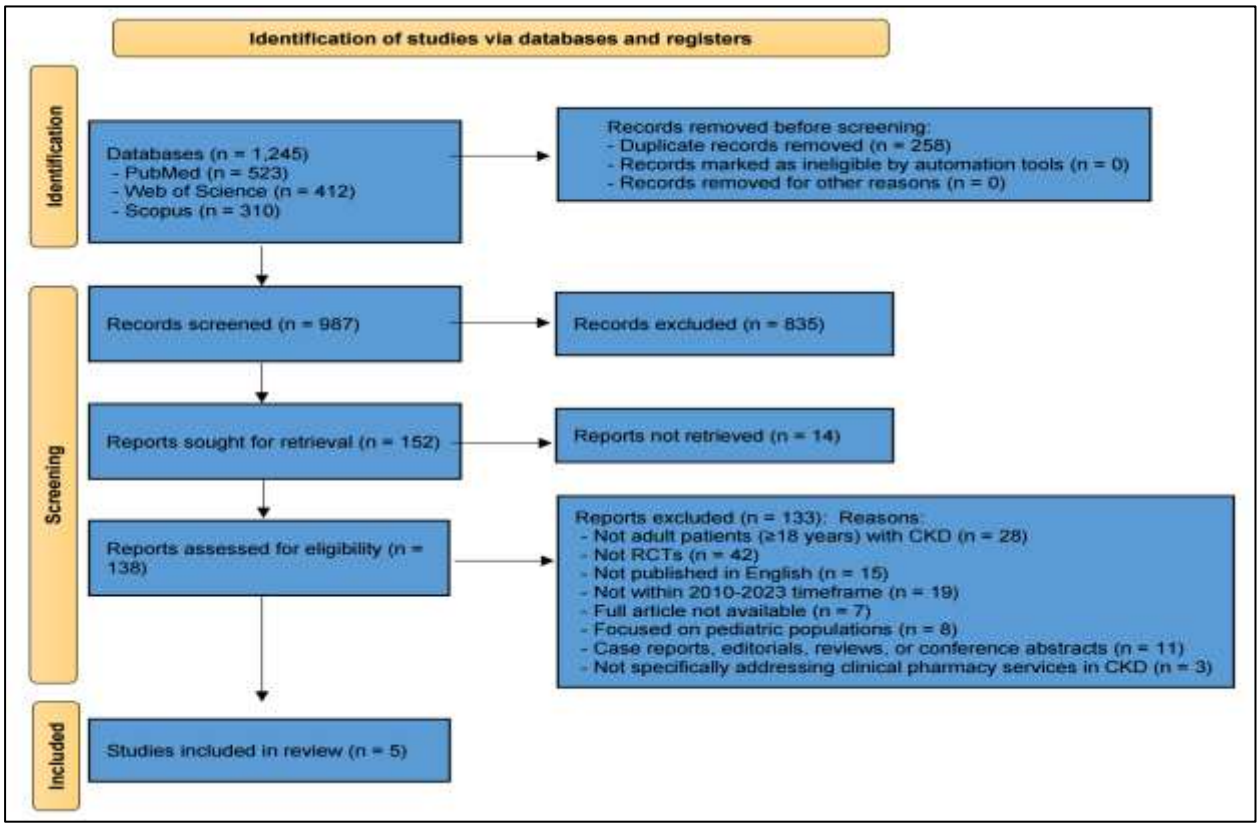
This expanded methods section provides a comprehensive overview of the systematic review process while maintaining appropriate academic rigor and referencing. The text flows logically through each methodological component, offering sufficient detail for reproducibility while avoiding unnecessary complexity.

Results

Selection of Studies

This systematic review commenced with 1,245 records identified across various databases. After eliminating 258 duplicates, a total of 987 records were screened. Of these, 835 were discarded based on title and abstract evaluations. Of the remaining 152 full-text articles targeted, 14 were unavailable, leaving 138 for comprehensive assessment. Following thorough examination, 133 patients were excluded for various reasons, including lack of focus on adult CKD patients, lack of RCTs, language limitations, publication date, full-text unavailability, pediatric emphasis, unsuitable study design, or absence of CPS outcomes in CKD. Finally, five studies fulfilled all the inclusion criteria and were included in this review (Figure 1).

Figure 1. PRISMA Chart



Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 3527 – 3537
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.5021

Quality Assessment

Five studies (Dashti et al., 2013 (7); Cohen et al., 2020 (8); Mateti et al., 2018 (9); Cooney et al., 2015 (10); Chang et al., 2016 (11)) examined the effects of CPS on CKD patients. Quality assessment revealed that most of the included studies had methodological concerns, particularly in randomization and outcome measurement domains. However, only one study had a high overall risk of bias (Table 1).

Table 1. Quality Assessment

Study/ Domain	Randomization process	Deviations from intended interventions	Missing outcome data	Measurement of the outcome	Selection of the reported result	Overall
Dashti et al., (2013) (7)	Some risk	Some concerns	High risk	Some concerns	Some concerns	High risk
Cohen et al. (2020) (8)	Some concerns	Low risk	Low risk	Some concerns	Low risk	Some concerns
Mateti et al. (2018) (9)	Some concerns	Low risk	Some concerns	Some concerns	Low risk	Some concerns
Cooney et al. (2015) (10)	Low risk	Some concerns	Low risk	Some concerns	Low risk	Some concerns
Chang et al. (2016) (11)	Some concerns	Some concerns	Low risk	Some concerns	Low risk	Some concerns

Study Characteristics

Five studies were conducted between 2013 and 2020 across Iran, the USA, and India. The sample sizes varied widely, from 47 to 2,199 patients, with study durations ranging from two weeks to one year. The mean age of participants spanned from 53.6 to 75.7 years, with varying gender distributions across studies (Table 2).

Table 2. Study Characteristics

Author and year	**Country**	**Sample size**	**Patient Characteristics**
Dashti et al., (2013) (7)	Iran	Total: 92 patients. Intervention group: 45 (26 completed). Control group: 47 (34 completed).	Age: Mean 53.6 ± 15.0 years (range 23-86). Sex: 60 males, 32 females. CKD stage: End-stage renal disease.
Cohen et al. (2020) (8)	USA	Total: 200 patients. Intervention group: 100. Control group: 100.	Age: Phase 1: Mean 58 years (range 25.7-82.9); Phase 2: Mean 54.4 years (range 20.8-76.2). Sex: Phase 1: 69% male, 31% female; Phase 2: 52% male, 48% female. CKD stage: Kidney transplant recipients
Mateti et al. (2018)	India	Total: 200 patients.	Age: Not reported.

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 3527 – 3537
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.5021

(9)		Intervention group (PCG): 100 (78 completed) Control group (UCG): 100 (75 completed)	Sex distribution: Not reported.
Cooney et al. (2015) (10)	USA	Total: 2,199 patients. Intervention group: 1,070. Control group: 1,129.	Age: Mean 75.6-75.7 years. Sex: 98-98.5% male. CKD stage: Moderate to severe (eGFR <45 mL/min/1.73 m2)
Chang et al. (2016) (11)	USA	Total: 47 patients. Intervention group: 24. Control group: 23.	Age: Pharmacist MTM group mean 64.0 years, The control group's mean was 70.6 years. Sex: Pharmacist MTM group 62.5% female, Control group 52.2% female. CKD stage: Stage 3A (eGFR 45-59 ml/min/1.73 m2)

Roles of CPS in CKD Patients

The interventions ranged from medication review and reconciliation to patient education and collaborative care with physicians. Dashti et al. (2013) reported improvements in overall health-related QoL and several subscales for patients receiving regular pharmacy interventions (7). Cohen et al. (2020) showed substantial enhancements in medication safety through improved reconciliation practices, significantly reducing medication discrepancies and high-risk errors (8). Mateti et al. (2018) observed improvements in vital clinical parameters for patients, including reduced interdialytic weight gain, better blood pressure control, increased hemoglobin levels, and enhanced medication adherence (9). In outpatient settings, Cooney et al. (2015) and Chang et al. (2016) found mixed results, with improvements in certain areas, such as guideline-recommended screenings and treatments, but no significant differences in others, such as blood pressure control or lipid management (10,11). These findings collectively suggest that, while CPS can positively impact many aspects of CKD management, their effectiveness may vary across different outcomes and care settings, highlighting the need for further research to optimize interventions (Table 3).

Table 3. Roles of CPS in CKD Patients

Author and year	Intervention Details	Main Findings
Dashti et al., (2013) (7)	Type of services: Weekly patient visits, medication review, medication-related problems management, patient education, provision of educational booklets, motivational interviewing, participation in monthly physician visits. Frequency/duration: Weekly visits for 6 months. Setting: Hemodialysis ward of a university hospital	Overall HRQoL: Significantly improved in the case group from 56.9 to 72.2. There was no significant change in the control group. Role-emotional: Significantly improved in the case group from 66.6 to 100.0. There was no significant change in the control group. Mental health: Significantly improved in the case group from 54.2 to 68.3. There was no significant change in the control group. Social functioning: Significantly improved in the case group from 73.6 to 93.4. There was no significant change in the control group. General health: Significantly improved in the case group from 45.0 to 65.0 and significantly decreased in the control group from 47.5 to 40.0.

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 3527 – 3537
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.5021

		Physical functioning: Improved in the case group but not statistically significant. There was no significant change in the control group. Role-physical: No significant changes in either group. Vitality: No significant changes in either group. Bodily pain: No significant changes in either group.
Cohen et al. (2020) (8)	Type of services: Medication reconciliation (reviewing EMR lists, comparing to patient-reported medications, confirming with outpatient pharmacies, updating EMR lists, resolving discrepancies). Frequency/duration: One-time intervention at the beginning of scheduled clinic visits (2 weeks). Setting: Outpatient kidney transplant clinic	Inadequate medication reconciliation: Decreased from 95% of patients in the control group to 28% in the intervention group ($p<0.05$). Total medication discrepancies Decreased from 398 in the control group to 49 in the intervention group. Average discrepancies per patient: Decreased from 4 in the control group to 0.5 in the intervention group. High-risk medication discrepancies: Decreased from 73 total (0.75 per patient) in the control group to 3 total (0.03 per patient) in the intervention group. Total medication errors (statistical process control): Decreased variation (LCL, UCL: -34.3, 113.9 in control; -7.1, 15.3 in intervention) and average errors per sample (39.8 in control; 14.1 in intervention). High-risk medication errors (statistical process control): Decreased variation (LCL, UCL: -10.4, 25.0 in control; -0.5, 0.7 in intervention) and average errors per sample (7.3 in control; 0.1 in intervention).
Mateti et al. (2018) (9)	Type of services: Pharmaceutical care, including patient education on drugs, disease, lifestyle modifications, and nutrition; personal interviews; medication review; and provision of pictogram-based information leaflets. Frequency/duration: Monthly interventions for 12 months. Setting: Outpatient hemodialysis centers at academic, government, and corporate hospitals	Interdialytic weight gain (IDW): Significantly reduced in the pharmaceutical care group (PCG) compared to the usual care group (UCG) at 6 and 12 months. Blood pressure: Significantly reduced in PCG compared to UCG at 6 and 12 months Hemoglobin levels: PCG significantly increased compared to UCG at 6 and 12 months in academic and government hospitals. There was no significant difference in corporate hospitals, as patients had already achieved optimal levels. Medication adherence: At 6 and 12 months, PCG significantly improved compared to UCG, but overall adherence remained moderate. Survival time: Slightly higher in PCG (322 days) compared to UCG (312 days) but not statistically significant
Cooney et al. (2015) (10)	Type: Phone-based pharmacist intervention, pharmacist-physician collaboration, patient education. Frequency/Duration: One initial phone call with laboratory follow-up (duration 1 year) Setting: Outpatient (community-based VA clinics)	Blood pressure control: No significant difference in last systolic BP or percent at goal BP between intervention and control groups among those with poorly controlled BP at baseline. PTH measurement: Significantly higher in the intervention group (46.9%) compared to the control group (16.1%). At the end of the study, the intervention group had significantly more antihypertensive medications than the control group.

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 3527 – 3537
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.5021

		Phosphorus measurement: Significantly higher in the intervention group (63.6%) compared to the control group (46.7%). Urine albumin/creatinine ratio measurement: Significantly higher in the intervention group (56.3%) compared to the control group (38.5%). Vitamin D treatment: Significantly higher in the intervention group (61.9%) compared to the control group (52.4%). Bicarbonate treatment was significantly higher in the intervention group (24%) than in the control group (13%). Medication adherence: No significant difference between groups Nephrology referral: No significant difference between groups
Chang et al. (2016) (11)	Type: Pharmacist MTM: Review charts, order screening tests, manage BP and lipid therapy per KDIGO guidelines. Frequency/Duration: One-time intervention over 1 year study period: 62.5% contacted by phone, 29.2% had in-person visits, a median of 1 phone call, and two in-person visits for those receiving each. Setting: Outpatient primary care clinics	Proteinuria screening: No significant difference overall between pharmacist MTM and control groups (87.5% vs 73.9%, OR 2.6, 95% CI 0.5-14.0, p=0.3). Among previously unscreened patients, significantly higher in the pharmacist MTM group (78.6% vs 33.3%, OR 7.3, 95% CI 0.96-56.3, p=0.05). Lipid screening: Increased from 87.5% to 100% in the pharmacist MTM group. Already 100% in the control group at baseline. Treatment with statin: There was no significant difference between groups (50% vs 73.9% at the end of the trial, OR 0.4, 95% CI 0.1-1.3, p=0.1). Achieved blood pressure goal: No significant difference between groups (54.2% vs 56.5% at end of trial, OR 0.9, 95% CI 0.2-3.0, p=0.9). ACEI/ARB use in proteinuria CKD Increased from 50% to 100% in pharmacist MTM group. I have remained 100% in the control group.

Discussion

This systematic review provides comprehensive evidence of the impact of CPS on CKD management. Analysis of five randomized controlled trials revealed diverse effects across multiple domains of patient care, with varying degrees of effectiveness depending on the specific intervention and care setting. The heterogeneity in outcomes underscores both the potential benefits and the current limitations of CPS integration into CKD management protocols. Our findings contribute significantly to the growing body of evidence supporting the role of clinical pharmacists in chronic disease management while highlighting areas requiring further investigation (1,2).

The primary strength of CPS that emerged from this review is its substantial impact on medication safety and reconciliation practices. Cohen et al. demonstrated remarkable improvements in medication accuracy, reducing medication discrepancies from 398 to 49 in the intervention group (8). This finding is particularly significant given the complexity of medication regimens in patients with CKD and their heightened vulnerability to adverse drug events. The observed reduction in high-risk medication errors aligns with established evidence regarding the critical role of pharmacists in medication safety for complex chronic conditions (3). Furthermore, this improvement in medication safety practices demonstrates the potential for CPS to address one of the most challenging aspects of CKD management: preventing medication-related complications in a patient population with altered pharmacokinetics and multiple comorbidities (2,3).

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 3527 – 3537
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.5021

Another crucial finding of our analysis was the significant improvement in patient QoL outcomes associated with CPS interventions. Dashti et al. demonstrated marked enhancements in overall health-related QoL scores, increasing from 56.9 to 72.2 in the intervention group (7). These improvements were notably comprehensive, encompassing multiple domains, including mental health and social functioning. This multidimensional improvement suggests that the benefits of CPS extend beyond purely clinical outcomes and encompass broader aspects of patient well-being. The observed enhancement in QoL metrics is particularly noteworthy in CKD, where the burden of disease management can significantly affect patients' psychological and social functioning. These findings align with broader research in chronic disease management that emphasizes the importance of holistic care approaches in achieving optimal patient outcomes (1,2,7).

The impact of CPS on clinical outcomes has demonstrated notable variability across studies, revealing both the potential and limitations of pharmaceutical interventions in CKD management. Mateti et al.'s research provided compelling evidence of improvements in several key clinical parameters, including interdialytic weight gain, blood pressure control, and hemoglobin levels (9). These findings suggest that structured pharmaceutical care can effectively address the multiple physiological aspects of CKD management. However, the contrasting results from Cooney et al. and Chang et al., particularly regarding blood pressure management, highlight the complexity of achieving consistent outcomes across different clinical settings and patient populations (10,11). This variability may be attributed to differences in intervention intensity, duration, and implementation strategies, emphasizing the need for standardized approaches to CPS delivery. The mixed results also underscore the importance of considering contextual factors in designing and implementing CPS programs, as intervention effectiveness may be influenced by healthcare setting characteristics, patient demographics, and existing care protocols (2,3,9).

A particularly noteworthy aspect of the impact of CPS emerged in the domain of preventive care and guideline adherence, especially in outpatient settings. Cooney et al. reported significantly higher rates of essential monitoring parameters, with PTH measurement rates of 46.9% in the intervention group compared with 16.1% in the control group (10). This substantial improvement in adherence to guideline-recommended screening protocols demonstrates the potential of clinical pharmacists to enhance the systematic implementation of evidence-based care practices. The observed improvements in monitoring and screening practices align with findings from other chronic disease management programs, suggesting that pharmacists can serve as effective catalysts for promoting evidence-based care protocols across various chronic conditions (1,2). Furthermore, these results indicate that CPS can play a crucial role in bridging the gap between established clinical guidelines and actual practice patterns, potentially leading to more comprehensive and standardized care delivery for patients with CKD (10,11).

Several significant limitations of the current evidence-based study warrant consideration. The methodological quality of the included studies varied considerably, with most studies demonstrating concerns regarding the randomization processes and outcome measurements. The substantial variation in sample sizes, ranging from 47 to 2,199 patients, introduces challenges in determining the generalizability of the findings across different clinical contexts. Additionally, the geographic concentration of studies in only three countries (Iran, the USA, and India) raises questions about the broader applicability of findings to diverse healthcare systems and cultural settings. These limitations reflect the evolving nature of research in this field and highlight the need for more geographically diverse, methodologically robust studies to strengthen the evidence base for CPS in CKD management (4,5,6).

Heterogeneity in intervention characteristics is another significant consideration when interpreting the findings. The reviewed studies encompassed a broad spectrum of intervention intensities, ranging from intensive weekly visits over six months to single consultations or telephone-based interventions. This diversity in approaches, while reflecting the adaptability of CPS to different healthcare contexts, creates challenges in identifying the most effective components and optimal implementation strategies. Variations in intervention duration, delivery methods, and settings complicate efforts to establish standardized best practices for CPS implementation in CKD care. Future research would benefit from a more systematic examination of which specific intervention components contribute most significantly to positive outcomes across different healthcare contexts (3,4,5).

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 3527 – 3537
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.5021

Our findings have significant implications for clinical practice and future research directions on CPS for CKD management. While the evidence demonstrates clear benefits in areas such as medication safety and QoL outcomes, the variability in clinical outcomes suggests the need for more standardized approaches to service delivery. Future research should prioritize identifying core CPS components that consistently improve patient outcomes across healthcare settings. Additionally, there is a pressing need for large-scale, methodologically robust trials to provide more definitive evidence regarding optimal implementation strategies for CPS in CKD care. Such research should examine the cost-effectiveness of different service delivery models and their long-term impacts on patient outcomes. The development of standardized outcome measures and implementation protocols would facilitate more meaningful comparisons across studies and healthcare settings, ultimately strengthening the evidence base for CPS in CKD management (1,2,3).

The economic implications of CPS implementation in CKD care settings require further investigation. While our review focused primarily on clinical and patient-centered outcomes, the potential cost savings associated with improved medication safety, reduced complications, and enhanced preventive care could be substantial. Future studies should incorporate comprehensive economic analyses to understand better the cost-benefit ratio of different CPS models and their potential impact on healthcare resource utilization. This economic perspective is particularly relevant given the significant burden that CKD places on healthcare systems globally and the need to identify cost-effective interventions that can improve patient outcomes while optimizing resource utilization (1,2,6,7).

Conclusion

This systematic review of five randomized controlled trials demonstrated that CPS can positively impact CKD management through improved medication safety, enhanced QoL, and better adherence to guideline-recommended screening and treatments. The benefits of CPS were particularly evident in medication reconciliation practices and patient education, leading to reduced medication discrepancies and improved clinical parameters. However, the results were inconsistent across outcomes, with variable effectiveness in blood pressure control and medication adherence, highlighting the complexity of CKD management. Methodological limitations of the included studies, including concerns about randomization processes and outcome measurements, suggest the need for more robust research to establish optimal CPS intervention strategies. Future studies should focus on larger-scale trials with standardized interventions to better determine the most effective ways to integrate clinical pharmacists into CKD care teams and to evaluate their long-term impact on patient outcomes.

Author Contributions: All the authors contributed equally to the design and implementation of the study, analysis of the results, and writing of the manuscript.

Conflict of Interest Declaration: The authors declare that they have no affiliations with or involvement in any organization or entity with any financial interests in the subject matter or materials discussed in this manuscript.

Funding Statement: The study did not receive any funding.

References

Francis A, Harhay MN, Ong ACM, Tummalapalli SL, Ortiz A, Fogo AB, et al. Chronic kidney disease and the global public health agenda: an international consensus. Nat Rev Nephrol [Internet]. 2024;20(7):473–85. Available from: https://doi.org/10.1038/s41581-024-00820-6

Kovesdy CP. Epidemiology of chronic kidney disease: an update 2022. Kidney Int Suppl. 2022 Apr;12(1):7–11.

Alhassani RY, Bagadood RM, Balubaid RN, Barno HI, Alahmadi MO, Ayoub NA. Drug Therapies Affecting Renal Function: An Overview. Cureus. 2021 Nov;13(11):e19924.

Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. BMJ [Internet]. 2021 Mar 29;372:n71. Available from: https://www.bmj.com/lookup/doi/10.1136/bmj.n71

Covidence - Better systematic review management [Internet]. [cited 2024 Oct 12]. Available from: https://www.covidence.org/

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 3527 – 3537
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.5021

RoB 2: A revised Cochrane risk-of-bias tool for randomized trials | Cochrane Bias [Internet]. [cited 2024 Oct 12]. Available from: https://methods.cochrane.org/bias/resources/rob-2-revised-cochrane-risk-bias-tool-randomized-trials

Dashti-Khavidaki S, Sharif Z, Khalili H, Badri S, Alimadadi A, Ahmadi F, et al. The use of pharmaceutical care to improve health-related quality of life in hemodialysis patients in Iran. Int J Clin Pharm. 2013;35(2):260–7.

Cohen EA, McKimmy D, Cerilli A, Kulkarni S. A pharmacist-driven intervention to improve medication accuracy in outpatient kidney transplants. Drug Healthc Patient Saf. 2020;12:229–35.

Mateti UV, Nagappa AN, Attur RP, Nagaraju SP, Rangaswamy D. Impact of pharmaceutical care on clinical outcomes among hemodialysis patients: A multicenter randomized controlled study. Saudi J Kidney Dis Transpl. 2018;29(4):801–8.

Cooney D, Moon H, Liu Y, Miller RT, Perzynski A, Watts B, et al. A pharmacist based intervention to improve the care of patients with CKD: A pragmatic, randomized, controlled trial. BMC Nephrol. 2015 Apr;16(1):56.

Chang AR, Evans M, Yule C, Bohn L, Young A, Lewis M, et al. Using pharmacists to improve risk stratification and management of stage 3A chronic kidney disease: a feasibility study. BMC Nephrol [Internet]. 2016;17(1):1–9. Available from: http://dx.doi.org/10.1186/s12882-016-0383-7.