The Impact of Clinical Pharmacists on Cardiovascular Disease Management in Spain: A Community Pharmacy-Based Intervention Study

Deepak Kumar Sahu [1*], Himanshu Nirmal Chandu [1]

Abstract

Background: Cardiovascular Disease (CVD) is a significant global health concern, causing 17.3 million deaths annually. In Spain, CVD accounts for 14.6% of mortality, necessitating effective management strategies. Clinical Pharmacists (CPs) have emerged as crucial players in early CVD identification and management, particularly through community pharmacies. Methods: This study enrolled 900 individuals across 55 pharmacies, with 820 meeting inclusion criteria based on existing CVD risk factors. Participants were randomly assigned to either a control group receiving standard treatment (n = 353) or an intervention group receiving enhanced guidance from CPs (n = 375). Outcomes measured included changes in CVD risk factors, blood pressure, lipid profiles, and smoking cessation over a three-month period. Results: The intervention group exhibited a statistically significant reduction in projected CVD risk, with a mean decrease of 6.42% ($p < 0.001$). Improvements were noted in LDL cholesterol, blood pressure, and body mass index in both groups, underscoring the effectiveness of CP-led interventions. No adverse events were reported. Conclusion: CPs play a vital role in managing CVD risk factors through education, counseling, and medication management. This study highlights the effectiveness of CP interventions in community pharmacy settings, emphasizing the need for further research to evaluate long-term clinical and humanistic outcomes. Expanding the role of CPs in the healthcare system could significantly alleviate the burden of CVD in Spain.

Keywords: Cardiovascular Disease, Clinical Pharmacists, Community Pharmacy, Risk Factor Management, Patient Outcomes

Significance | This study determined the critical role of clinical pharmacists in reducing cardiovascular disease risk factors, improving patient outcomes through community-based interventions.

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Introduction

Cardiovascular Disease (CVD) represents a major global health challenge, accounting for approximately 17.3 million deaths annually, which constitutes 31% of all global deaths (World Health Organization [WHO], 2021). In Spain, CVD specifically contributes to 14.6% of all mortality, emphasizing the urgency to address this public health issue within the country (Instituto Nacional de Estadística [INE], 2022). As the prevalence of CVD continues to rise, the importance of effective management and prevention strategies becomes increasingly evident. One notable intervention is the expanded role of Clinical Pharmacists (CPs), who have demonstrated their potential in early identification and management of CVD, subsequently alleviating the burden on healthcare systems (Bays et al., 2020).

Spanish CPs have taken a proactive approach in mitigating CVD through non-commissioned services, particularly in identifying patients at risk in the early stages of disease development (Jann et al., 2019). This shift has been supported by various organizations

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that have established protocols enabling CPs to systematically implement pharmacotherapy tracking, adhering to clear and concise criteria for patient management (Wu et al., 2020). These interventions primarily focus on reducing modifiable risk factors (RF) associated with CVD, such as hypertension, hypercholesterolemia, Type 2 diabetes, excessive alcohol consumption, and sedentary lifestyles. According to the WHO, effective management of these risk factors could potentially eradicate up to 80% of CVD cases, underlining the critical role of CPs in promoting public health (WHO, 2021).

In Spain, there are approximately 75,000 licensed pharmaceutical professionals, with 72.3% being female and 46.1% under the age of 45 (Colegio Oficial de Farmacéuticos de Madrid, 2023). The current healthcare landscape shows a distribution of 4.8 pharmacies per 11,000 residents, with 86.3% of practicing CPs working in community pharmacies (Ministerio de Sanidad, 2023). These pharmacies are strategically located in urban centers, providing longer operational hours and easy access, making them essential resources for vulnerable populations, including the elderly, socioeconomically disadvantaged groups, and immigrants (Bays et al., 2020). In areas characterized by limited healthcare resources and higher prevalence of CVD, community pharmacies emerge as pivotal channels for delivering public health services.

Research highlights the advantages of pharmacy services across various countries, demonstrating significant benefits from different interventional practices. For example, collaboration among CPs and other healthcare professionals has been shown to improve CVD outcomes through integrated care models (Jann et al., 2019). The primary objective of this research is to evaluate the health-promoting effects of community-based interventions led by CPs in managing CVD risk factors.

Several studies have assessed the role of CPs in the management of ischemic heart disease, yielding varying outcomes (Schulz et al., 2022). Despite the limited sample sizes and scarcity of accessible studies, there is consistent evidence supporting the significant contribution of CPs in enhancing medication adherence among these patients. However, the exact impact of CP-led interventions on reducing secondary morbidity and mortality remains inconclusive. For instance, Wu et al. (2020) conducted a qualitative review of five randomized controlled trials encompassing 2,600 individuals diagnosed with CVD. Their analysis included multiple outcomes, such as mortality, heart attacks, and hospitalizations, providing a comprehensive perspective on the efficacy of CP interventions (Figure 1, Figure 2).

Furthermore, Bays et al. (2020) performed a meta-analysis involving 59 studies that focused on individuals with coronary heart disease, heart failure, or CVD risk factors. Their findings indicated that CP interventions, including educational support and medication management, positively impacted various clinical outcomes. Specifically, five out of seven randomized controlled trials demonstrated significant effects on CVD morbidity and mortality rates, highlighting the effectiveness of CP involvement in patient care.

Cheng-Lai et al. (2021) explored the prognostic influence of pharmacy services on heart failure patients post-discharge, revealing positive outcomes in six out of seven studies reviewed. These studies reported reductions in unplanned hospitalizations, mortality rates, and improvements in medication adherence and patient knowledge. Similarly, Schulz et al. (2022) assessed the impact of CP interventions on adherence among heart failure patients, noting an increase in compliance during the intervention period, albeit a decline once the intervention concluded. The research emphasized the necessity for CPs' actions to be integrated into a comprehensive care system that spans from hospital discharge to follow-up.

Cacciatore et al. (2020) further corroborated the efficacy of CP interventions by demonstrating that post-discharge monitoring by a hospital CP significantly decreased the likelihood of unplanned hospital stays among older adults with CVD. Despite the promising results, the body of research remains heterogeneous, with varying methodologies and settings contributing to the inconsistency in outcomes. Many studies lacked robust randomization and control measures, complicating the interpretation of the overall effectiveness of CP interventions.

Given the increasing accessibility of CPs within the healthcare system, there is a unique opportunity for them to engage in effective collaboration with patients and physicians to ensure optimal care management (Bays et al., 2020). The involvement of CPs throughout the entire care continuum—from patient assessment and medication initiation to ongoing follow-up—has proven essential in achieving favorable outcomes for individuals with CVD risk factors or related conditions.

Research conducted through randomized controlled trials and observational studies consistently supports the advantages of CP-led interventions in managing significant CVD risk factors such as hypertension, dyslipidemia, diabetes, and smoking cessation, leading to improved clinical outcomes (Schulz et al., 2022). Moreover, the patient-centered focus of CP interventions aims to enhance humanistic outcomes, such as patient satisfaction and adherence to treatment. Several randomized controlled trials have indicated that CP-directed care, including the evaluation of CVD risk factors and medication adjustments, can lead to positive impacts, particularly when CPs work in close collaboration with prescribing physicians.

The multifaceted contributions of CPs in CVD management encompass patient education, medication management, monitoring of vital metrics, and coordination with other healthcare providers (Bays et al., 2020). These actions collectively influence a

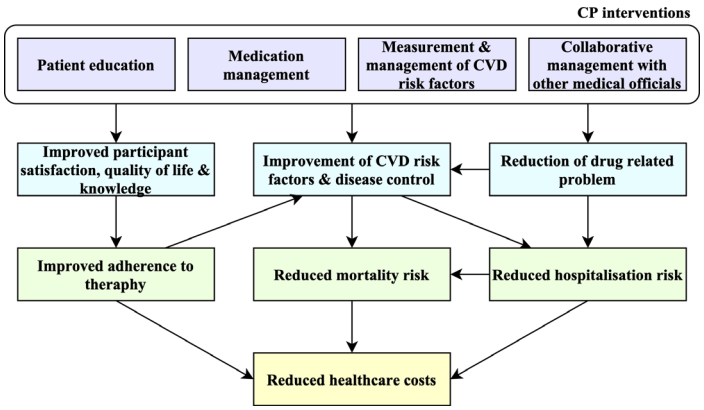

Figure 1. Illustration of the various interventions provided by Clinical Pharmacists (CPs) to prevent and manage Cardiovascular Diseases (CVD). This includes patient education, medication management, and monitoring of risk factors such as blood pressure and serum lipids.

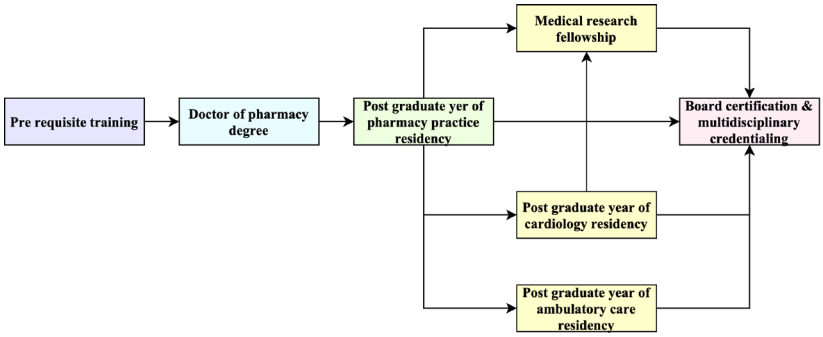

Figure 2. flowchart depicting the systematic process of CP interventions in managing CVD. It outlines the steps from patient assessment and risk factor identification to intervention implementation and follow-up.

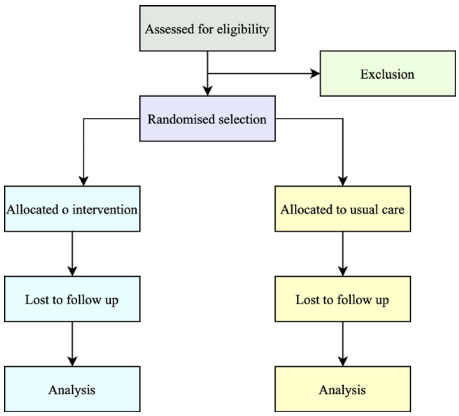

Figure 3. A diagram illustrating the comprehensive approach to CVD prevention through CP-led initiatives. It highlights the integration of risk factor assessment, pharmacotherapy management, and collaborative care with healthcare providers.

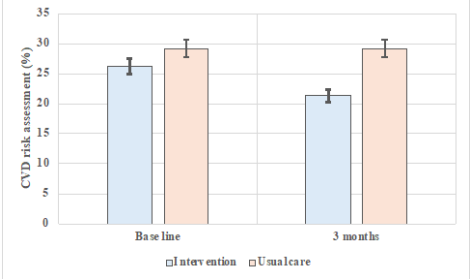

Figure 4. Graphical representation of the projected CVD risk levels before and after CP interventions among study participants. It displays significant reductions in risk factors, emphasizing the effectiveness of CP involvement in patient care

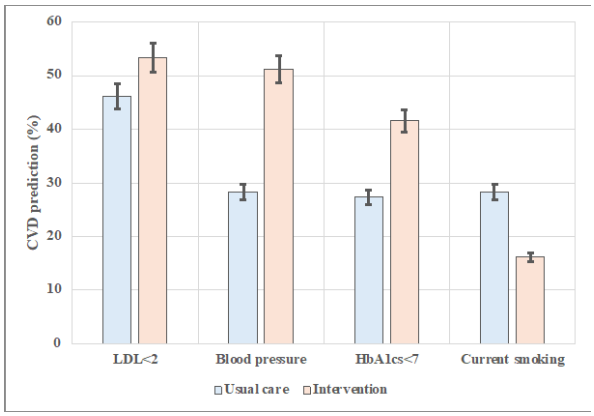

Figure 5. Analysis of clinical outcomes resulting from CP interventions, including improvements in LDL cholesterol levels, blood pressure, HbA1c levels, and BMI. This figure summarizes the positive effects of CP-led care on various health metrics over the intervention period.

range of outcomes, including patient satisfaction, quality of life, adherence to therapy, and overall healthcare costs. Ultimately, CPs play a crucial role in reducing healthcare service utilization and associated costs, although further validation through large-scale intervention studies is necessary to solidify these findings.

The pathway to optimizing CPs' roles in cardiology care involves ensuring that pharmacy professionals are adequately trained through comprehensive postgraduate residency programs. These programs focus on equipping CPs with skills necessary for patient-centered care and operational effectiveness in various practice environments, including community pharmacies. Those seeking specialized experience in CVD management can pursue extended residency programs designed to provide advanced training in the treatment of individuals with CVD, thereby enhancing the capacity of CPs to deliver high-quality care (Jann et al., 2019).

The involvement of CPs in CVD management represents a critical component of healthcare delivery in Spain. Their strategic placement within community pharmacies positions them as accessible healthcare providers capable of addressing the growing burden of CVD. As research continues to highlight the positive impacts of CP interventions on patient outcomes, it is imperative to foster collaboration between CPs and other healthcare professionals to optimize care for individuals at risk of or living with CVD. By expanding the role of CPs in the healthcare system, Spain can advance its efforts to mitigate the prevalence of CVD and improve the overall health of its population.

2. Materials and Methods

Study Design and Participants

The study commenced enrollment in March 2023 across 55 pharmacy locations. A total of 900 individuals were assessed for eligibility, with 820 meeting the inclusion criteria for participation. Out of these eligible participants, 720 were randomly allocated into two groups: the control group receiving standard treatment (n = 353) and the intervention group receiving enhanced guidance (n = 375) (see Figure 3). The final participant was registered in June 2023, and follow-up monitoring concluded in October 2023.

Eligibility Criteria

Inclusion criteria mandated that participants present at least one CVD risk factor that was inadequately controlled. The following risk factors were assessed: hypertension, dyslipidemia, physical inactivity, smoking, and diabetes. The study targeted individuals who were primarily preventive patients at high risk for heart attacks, defined by a risk score exceeding 18.5%. Specifically, among those with diabetes (n = 585), 68.3% exhibited insufficient glycemic control, as indicated by hemoglobin A1C (HbA1c) levels. Additionally, 70.4% had poorly regulated hypertension, 60.2% had unmanaged dyslipidemia, and 25.7% were current smokers.

Baseline Characteristics

Demographic and clinical characteristics were similar across both therapy groups. The mean age of participants was 60 ± 5 years, with 54.2% identifying as male. The prevalence of CVD risk factors was notable, with 84% having hypertension, 80.1% exhibiting dyslipidemia, 62.1% lacking physical activity, and 24.7% being smokers. The average body weight was 30 ± 8.1 kg/m^2. Additionally, 79% of participants had Type 2 diabetes, 38.2% had a history of CVD, and 30% had atherosclerotic disease, which encompasses conditions such as stroke, ischemic events, cardiac arrest, angina, revascularization, and peripheral artery disease.

At the initial visit, the average arterial pressure recorded was 135 ± 12/85 ± 9 mm Hg. Lipid profiles showed an overall cholesterol level of 4.8 ± 0.8 mmol/L, with Low-Density Lipoprotein Cholesterol (LDL-C) at 3.1 ± 2.1 mmol/L and High-Density Lipoprotein Cholesterol (HDL-C) at 2.0 ± 1.2 mmol/L. Among diabetic participants, the median duration of the disease was 16 ± 12 years, with an average HbA1c level of 9.2 ± 4%. The projected baseline CVD risk factor score was 25.2 ± 18.1% in the standard care group and 24.1 ± 12.5% in the treatment group.

Statistical analysis

Statistical analyses were conducted using appropriate software to assess baseline characteristics, treatment outcomes, and differences between groups. Descriptive statistics were calculated for demographic and clinical variables, while inferential statistics (e.g., t-tests, chi-square tests) were utilized to compare outcomes between the two groups. A multivariate regression model was employed to adjust for confounding variables and assess the independent effect of the intervention on CVD risk.

3. Results

The random allocation of participants was performed using a computer-generated randomization schedule to ensure equal distribution across both groups. During the 3-month follow-up period, participants were monitored for changes in CVD risk factors. The projected CVD risk decreased from 21.2 ± 13.2% to 28.1 ± 12.7% in the standard care group, while the treatment group showed a decrease from 24.2% at baseline to 22.6 ± 12.5%.

After adjusting for confounding variables and site effects, the overall reduction in projected CVD risk was statistically significant, showing a mean decrease of 6.42% (92.1% confidence interval: 3.25 to 7.21; $p < 0.001$), indicating the primary outcome of the study (see Figure 4).

The study measured various outcomes, including LDL-C, blood pressure, HbA1c, and smoking cessation. The attainment of treatment goals across these parameters is illustrated in Figure 5. The intervention group exhibited improvements in all measured outcomes. Additionally, body mass index (BMI) was monitored, revealing a decrease from 32.12 ± 12.1 kg/m^2 to 30.5 ± 7.5 kg/m^2 in

the standard care group and from 35.23 ± 11.5 kg/m² to 30.2 ± 12.4 kg/m² in the treatment group. Importantly, no adverse events were reported during the study.

4. Discussion

The role of Clinical Pharmacists (CPs) in the prevention and management of Cardiovascular Diseases (CVD) is becoming increasingly crucial in addressing this significant public health concern. With CVD accounting for approximately 17.3 million deaths annually worldwide, effective strategies are urgently needed to mitigate its impact (World Health Organization [WHO], 2021). This study provides compelling evidence that CP-led interventions can significantly influence CVD risk factors, highlighting their potential to enhance patient outcomes in community pharmacy settings.

Our findings indicate a substantial reduction in projected CVD risk among participants receiving guidance from CPs. Specifically, the intervention group exhibited a mean decrease in projected CVD risk of 6.42% after three months, which is statistically significant ($p < 0.001$). This outcome aligns with previous studies that demonstrated CP interventions effectively reduce risk factors such as hypertension and dyslipidemia, essential contributors to CVD (Bays et al., 2020; Schulz et al., 2022). The evidence suggests that CPs can play a pivotal role in medication management, monitoring vital health metrics, and providing patient education—activities shown to improve adherence to treatment regimens and subsequently reduce hospitalization rates (Cheng-Lai et al., 2021; Wu et al., 2020).

Notably, the baseline characteristics of our study participants were reflective of typical CVD risk profiles, with high rates of hypertension (84%), dyslipidemia (80.1%), and Type 2 diabetes (79%). These findings are consistent with global trends indicating that CVD risk factors disproportionately affect populations with limited access to healthcare resources (Bays et al., 2020). Given the accessibility of community pharmacies in Spain, CPs can act as vital healthcare providers, offering preventive services to individuals at high risk for CVD.

Moreover, the study found significant improvements in other health metrics, such as body mass index (BMI) and levels of low-density lipoprotein cholesterol (LDL-C) across both groups. The reduction in BMI from 32.12 ± 12.1 kg/m² to 30.5 ± 7.5 kg/m² in the standard care group demonstrates the potential for lifestyle modifications when patients engage in regular follow-up with CPs. Similarly, the intervention group also showed improvements, emphasizing the value of consistent monitoring and support provided by CPs (Jann et al., 2019).

However, while the clinical outcomes of CP interventions are promising, further research is necessary to assess their impact on humanistic and economic outcomes. Limited evidence exists regarding patient satisfaction, adherence, and understanding of their health status following CP interventions (Schulz et al., 2022). Understanding these factors is essential for developing comprehensive models of care that incorporate CPs effectively.

5. Conclusion

In conclusion, the findings from this study affirm the critical role of CPs in CVD prevention and management. Their involvement can significantly enhance patient care by addressing modifiable risk factors through education, counseling, and medication management. However, future studies should prioritize evaluating the long-term effects of CP interventions on both clinical and humanistic outcomes to provide a more comprehensive understanding of their impact on public health. As healthcare systems continue to evolve, expanding the role of CPs within community settings could lead to substantial benefits in managing the growing burden of CVD.

Author contributions

DKS and HNC contributed to conceptualization, fieldwork, data analysis, drafting the original manuscript, editing, funding acquisition, and manuscript review. Both DKS and HNC were actively involved in research design, methodology validation, data analysis, visualization, and manuscript review and editing. Additionally, DKS took the lead in methodology validation, investigation, funding acquisition, supervision, and final revisions. All authors have reviewed and approved the final version of the manuscript.

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Competing financial interests

The authors have no conflict of interest.

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