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# A Multi-Centre Study to Integrate Clinical Pharmacists into Primary Care as a Form of Chronic Disease Management

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## Abstract
***This multi-center implementation study was aimed at assessing the effect of implementing clinical pharmacists in primary care teams as part of managing chronic diseases (diabetes, hypertension, and dyslipidemia). Its total enrollment was 300 patients spread over six primary care clinics in Ghana and Cyprus who were tracked over a period of 6 months. Pharmacists did some medication therapy management (MTM) activities, tracked lab values, titrated medication, and collaborated with physicians. The intervention showed very good results in HbA1c (-1.2 percent), systolic blood pressure (-11.4 mmHg), and LDL-cholesterol (-18.7 mg/dL) ($p < 0.01$.). The performance of patient compliance improved by 22 percent, and physician satisfaction with the pharmacist cooperation was great. Such results point to the potential of incorporating pharmacists into primary care as a practice to enhance chronic disease management and outcomes in resource-scarce environments.***

**Keywords:** ***Clinical pharmacists, Primary care teams, Chronic disease management, Medication therapy management, Diabetes, Hypertension, Dyslipidemia, Adherence to treatment, Contentment with physician.***

## 1. Introduction

### 1.1 Primary Care Chronic Disease Burden

Diseases like diabetes and hypertension, including dyslipidemia, have emerged as a tremendous burden in the primary care system, consuming a lot of expenditures in healthcare as well as helping in contributing a large part of the disease burden globally. Due to this aging global population and the increase in lifestyle related disease, it is likely that there is going to be an increase in the prevalance of these conditions, hence there is need to manage them effectively. These conditions are usually treated simultaneously in primary care, which results in a complicated treatment regime of a patient, especially in the case of an older adult or a multimorbid patient. To adequately deal with multiple chronic conditions, it is not just enough to employ pharmacological measures; however, it is essential to have different and specific healthcare providers coordinate closely together.

Chronic diseases have been known to not only increase the mortality rate but also reduce quality of life and increase the disable merit. These diseases cause life-long needs to pursue care and support such as management of medication, monitoring of laboratory findings, and adherence. Nonetheless, regardless of its attempts, the pressure of primary care systems remains high, and there is an issue of a large number of patients not being in effective control of their conditions. This has reduced the attention to multidisciplinary approaches, especially with the inclusion of clinical pharmacists so as to address care coordination and maximize therapeutic outcomes in the management of chronic diseases.

### 1.2 Medication Optimization and Continuity of Care Complexity

Medication optimization is one of the most important issues in chronic disease management in the area of primary care. Polypharmacy occurs when many of the patients with chronic conditions are on many medications, which augers more dangers of drug interactions, adverse drug events, and nonadherence. Specifically, polypharmacy is ubiquitous in populations with comorbidity and has to be controlled with assiduous medication planning where each treatment must not only be sufficient but also safe. The need of using multiple drugs also requires frequent follow up of dosages, lab values, and side effects all which are time consuming to the primary care providers, especially working within a low resource-setting.(1)

Besides the issue of medication optimization, another issue of concern is the continuity of care. Once the patients are out of the hospital or expert care, the move to primary care is likely to be characterized by discrepancies on medication, a dearth of proper communication, and poor follow-ups. These gaps can lead to poor medication adherence, unmanaged chronic disease and preventable readmissions. To ensure proper chronic disease

management, a proper medication reviewing, monitoring and educating the patients on chronic diseases should be ongoing to reduce chances of such problems. This necessitates a more coherent delivery of care particularly on the environments that have constrained resources and care providers.

### 1.3 Clinical Pharmacist-led Chronic Disease Management

Clinical pharmacists are in a position to help resolve a lot of the issues surrounding chronic disease management especially in an ambulatory care. They are also particularly trained on the medication therapy management (MTM), pharmacology and patient counseling to streamline medication regimens, improve adherence and reduce adverse drug events. Clinical pharmacists Recurrently play a wide range of jobs in the management of chronic diseases, such as:

This is done by assessing medications through complete medication review that the medication that was prescribed to them is effective, safe, and suitable to the condition of the patient.(2)

Noticing the modifications in the values of laboratory and adjusting the doses of medications accordingly.

Using the active involvement of primary care physicians to adjust therapy regimens according to the patient and changing clinical health guidelines.

Training patients on the relevance of taking medications and assisting them on how to deal with side effects.

There is a growing race to include clinical pharmacists as a part of the primary care team, which is a vital part of high-quality care, especially in patients with complicated chronic illnesses. Pharmacists bridge the continuity gap and connect the management of chronic diseases by addressing its weaknesses and contributing the missing contact between the patient and the physician and other health care specialists.

### 1.4 Evidence Gaps resulting out of Meaningful Implementation Studies using Multi Centers

Although the positive effects of the incorporation of pharmacists in primary care teams have been identified, there remains insufficient evidence base to quantify the effects on a large scale level of different multi-centric studies. Most of the current evidence is provided by the single-center research or small trial and sometimes, the findings cannot be used to present general policy advice. Furthermore, a large portion of the research revolves around a particular disease or setting, which restricts the generalizability of the results of the research to multimorbidity patients or the resource-limited settings. More multi-site studies are required to evaluate the ability of pharmacist-led interventions to enhance clinical outcomes, medication adherence and patient satisfaction in primary care centers that have a wide range of patients.

### 1.5 GOALs OF THE CURRENT PHARMACIST-INTEGRATION STUDY

The aim of the proposed research is determining the effectiveness of such an experiment as incorporating clinical pharmacists as an element of primary care teams in a multi-center environment with regard to treating chronic diseases. The aim of the study is specifically to determine the effects of pharmacist-led interventions on diabetes, hypertension, and dyslipidemia in clinics that provide primary care in two countries that have difference health care systems such as Ghana and Cyprus. The trial will measure the key outcomes on clinical outcomes, HbA1c, blood pressure, LDL cholesterol, and patient adherence, in an attempt to provide valuable information regarding the efficacy and possibility of pharmacist inclusion in the management and treatment of chronic diseases in low-income setups.

This study will help address the gaps in the knowledge base about the role of clinical pharmacists within primary care teams, and ensure that the lessons learned help inform, and shape, policies and practices to optimize management of chronic diseases around the world.(3)

## 2. Provides a Frame-Work of Team-Based Pharmaceutical Care

### 2.1 Integrated Care and Interprofessional Collaboration concept

An integrated care is described as a coordinated care with the cooperation of several healthcare providers to achieve comprehensive and patient-centric care. The method is especially significant when dealing with chronic diseases, that frequently involve the experience of different healthcare specialists in order to cater to the multifaceted and multifaceted patient profile. The foundation of integrated practice, interprofessional collaboration implies the work of professionals of various disciplines cooperating, thus maximizing patient care and sharing relevant information and individualized treatment plans.

Pharmacist teaming in primary care facilities complements continuity of care as they work to solve medicine-related issues and assure proper, secure, and effortful treatment regimes. Pharmacists collaborate with other healthcare professionals in order to organize patient care, guarantee their adherence to medications, and check

possible drug interactions. When interprofessional collaboration is done, there are better health outcomes, particularly among the populations that are dealing with chronic illnesses such as diabetes, hypertension, and dyslipidemia.

**2.2 The Pharmacist Roles and Responsibilities in the Ambulatory Care**

Pharmacists in the ambulatory care setting are needed to oversee chronic disease treatment. As compared to hospital practice where the pharmacists are mostly concerned with in-patient care, the pharmacists may play a more active role in monitoring the long-term health of chronic patients in ambulatory care. The following are their most important services:

Medication therapy management (MTM): It is a process through which pharmacists examine the medication of the patients to make some clarifications that the medications would be suitable, effective, and safe. These include the evaluation of the history of drugs used by the patient, proliferation of drug interactions, and the reinforcement with the prescribed medications aligned with clinical guidelines.(4)

Education and counseling: Pharmacists should give education to patients on their conditions and medications and should make them realize the significance of medication adherence and how to deal with the possible side effects. This is especially valuable to the patients with chronic conditions who might have to handle complicated treatment regimens.

Collaborative care: Pharmacists also work hand in hand with doctors and other health care professionals; hence they have improved coordinated care. They also involve themselves into care planning, give medication-related suggestions, and make sure that patients get a full-service care that incorporates all other factors concerning their chronic disorders

Ambulatory pharmacists can be particularly the most conveniently available personnel in the healthcare field and can be used effectively to bring a resolution to the medication-associated problems and offer continuous assistance to the patients with chronic disorders.

**2.3 A Key Practice Offered By Medication Therapy Management (MTM)**

Medication Therapy Management (MTM) is one of the strategies used by pharmacists, to optimize the respective regimens of their medications and better the subsequent outcomes in the patients with chronal diseases. MTM is a patient-focused practice that involves a thorough examination of the medication regime of a given patient, all the issues related to drugs, as well as advising the patient about the upcoming changes. The MTM characteristics of importance are:

Medication review: This aspect involves pharmacists reviewing the medication list of the patient to make sure that the entire set of prescribed medication is correct and necessary. This includes the drug interactions, contraindications as well as determining duplicative therapies and the problems related to changes in doses.

Counseling the patient: Pharmacists provide information as to how to take medicines, their side effects, and ways of making them favorable. This is especially in the area of chronic disease management where one needs to adhere to a long time period of taking medication to enable them control the disease and stop complications.

Partnership with health practitioners: Pharmacists must maintain communication with the medical professionals (physicians) and other healthcare practitioners to make sure that the medication regime of the patient is both optimal and that any issues with the medication can be resolved, ensuring that there are no possible issues associated with the medications.

There is an enhancement to reduce medication errors, to increase adherence and improve therapeutic outcomes of patients with chronic conditions with the help of MTM. It is also helpful in alleviating the hospital readmissions and emergencies, prevalent in patients suffering chronic diseases with poor management.(5)

**2.4 Lab Monitoring and Dose Adjustments on Protocol**

Ambulatory care pharmacists also facilitate significant treatment efforts, including dosage changes to fit the regulations and lab observation, especially when treating chronic conditions such as diabetes and hypertension. The protocol-based dose adjustments will warrant the best medication dose according to the clinical situation and laboratory findings of patients. The lab values tracked by pharmacists include HbA1c, sat-blood, and lipid profiles to determine the need to change medicines to have better control of the disease.

An example is a patient with hypertension, who will be subjected to changes in the medication as antihypertensive depending on the blood pressure. The effects of inadequate insulin therapy are comparable in terms of how diabetic patients should be monitored in regards to HbA1c. Pharmacists know how to interpret the lab results,

make some relevant changes regarding medications and cooperate with the other medical personnel in order to provide the patient with an effective treatment plan.

The proactive engagement will assist in ensuring that the patients are on the appropriate medicines in the right amount thus enhancing management of the disease and de-escalated complications that occur related to the disease.

**2.5 stakeholder estimated patient and provider outcomes**

Achieving the integration of clinical pharmacists to primary care teams has the potential to lead to significant positive effects in patient outcomes as well as satisfaction of the providers. The outcomes anticipated in the patients are:

Enhanced management of the disease: The interventions of the pharmacists like medication therapy management, dose manipulation, and lab surveillance creates better control over chronic disease, including better HbA1c, blood pressure, and lipid levels.

Increased drug compliance: In case there is scheduled counseling, patient education, and monitoring of medication, it would lead to increased drug compliance by patients, which would provide better health outcomes.

Fewer hospitalizations: With so much focus being encouraged on proper use of drugs and getting a diseased individual to optimum health, pharmacists will help in ensuring fewer complications that could have necessitated hospitalizations.(6)

To the providers, the inclusion of pharmacists in the care team is beneficial since it takes a lot of their time in handling cumbersome medication regimens. The level of physician satisfaction when it comes to collaboration with pharmacists is usually high, since pharmacists bring in insight on how medicines are used, leading to better clinical outcomes. Pharmacists can also be used as a source of queries in relation to medications, thus allowing the physicians to concentrate on other issues regarding the patients.

In general, the idea of incorporating pharmacists as part of the primary care teams has a strong advantage both to the patients in terms of managing diseases and to the team dynamic in healthcare since it makes the team more efficient and effective in general.

## 3. Research Design and Production

**3.1 The Multiple Sites Selected Multi-Center Site: Ghana and Cyprus**

Such a study took place in six primary care clinics that were situated in Ghana and Cyprus, two comparatively different countries that have different healthcare systems with different resource levels. The multi-center design was selected because this will help in determining the effect of the integration of clinical pharmacists in a broad spectrum of settings giving a general picture on how pharmacist-based interventions will help in chronic disease management in resource-constrained and resource-rich settings.

Some of the issues affecting the healthcare system in Ghana include easy access to healthcare resources, supply and availability of healthcare professionals and availability of infrastructure in some areas. Nevertheless, this is also an opportunity to study the potential of the pharmacist involvement in a resource-constrained environment when primary care might not be able to access the services of specialized providers on a full basis.

Cyprus, in turn, has a more resourceful setting because of a well-established healthcare system. This gives a clue to how the interventions led by pharmacists can be utilized in systems with improved infrastructure and resource. By conducting the study in these two countries, the research will be able to deliver valuable information on how various health care systems can take advantage of pharmacist-led chronic disease management initiatives and its scalability.(7)

**3.2 Enrolment criteria of patients and conditions targeted**

The research involved 300 patients among which every country made a contribution. The inclusion criteria of the study ran as follows:

Minimum age 18 years old.

Having been diagnosed with one or more of the following chronic conditions: diabetes, hypertension or dyslipidemia.

The patients had to be actively getting treatment on these ailments and had been under medication in three months or more before they could be enrolled.

Patients were required to be medically stable there are no acute conditions and need of treatment that entails complex interventions and there is urgent need to be hospitalized.

The first group consisted of patients who could give informed consent regarding their participation in the research and adhere to follow-up treatment.

The target conditions, diabetes, hypertension, and dyslipidemia are the most common chronic illnesses of aging persons all over the world. Most of these conditions have long-term needs, with complicated medication plans, and as such, they are perfect candidates to assess the effect of clinical pharmacist interventions. Both Cyprus and Ghana have high prevalence of these conditions making them a good cohort to pursue the study.

**3.3 Biographical Characterization of Pharmacist Interventions and Post-Interventional Protocols**

The aims of the pharmacist interventions were to maximize the use of pharmaceuticals, develop the clinical outcomes, and improve patient education. All the clinical pharmacists used in the research were trained to work in medication therapy management (MTM), patient counseling, and cooperation with primary care teams. Components of the intervention:

Medication Therapy Management (MTM): The pharmacists used to provide multifaceted medications reprieves of every individual. They found and solved the discrepancy of medications, including drug interactions, multiple therapies, and underuse of medications.

Dose Adjustments: The clinical guidelines and the lab results (the HbA1c, blood pressure, and lipid profiles) were the determinants of the dose adjustment of the medications by the pharmacists following predefined protocols. This guaranteed the best medicine combination to treat chronic diseases in the patients.

Lab Monitoring: Pharmacists monitored and kept watch on lab values of patients having chronic conditions in cooperation with patients. Frequent observation enabled on-time changes of medications and gave ideas about the efficacy of the treatment process.(8)

Patient Education and Adherence Support: The pharmacists offered individual counseling to the patients teaching them the need of medication adherence, lifestyle changes, and self-monitoring. Pharmacists also assisted patients with the side effects of the drug and the adherence obstacles.

After initial intervention, patients were followed after a period of 6 months and regular follow ups to monitor adherence, lab values, and adjust the medications were done. The patients were reached over the phone or on face-to-face visits after 1, 3, and 6 months had passed.

**3.4 Data and Sample Myth, Outcome Parameter and Statistical Measures**

The data collected was made to be in forms of clinical outcomes and patient-reported outcomes. Important data was collected and included:

Baseline Characteristics: The demographic therapy (age, gender, comorbidity), and clinical (pre-existing conditions, medications) data was obtained at the initial stage of the research process to characterize the study population and guarantee their comparability to one another.

- Clinical Outcome Parameters:
- Diabetes HbA1c.
- Hypertension management systolic blood pressure (SBP).
- Dyslipidemia It is the treatment of LDL cholesterol.
- Medication adherence, which is assessed by Morisky Medication Adherence Scale (MMAS -8).

Patients Reported Outcomes: The patient satisfaction was evaluated by using a satisfaction questionnaire that contained questions regarding their experience of the pharmacist intervention, the perceived benefit and the ease of communication.

Physician Satisfaction: Individual questionnaire was used to measure the satisfaction of the primary care physicians on the role of pharmacist in managing patients care with attention to the aspect of collaboration and effectiveness.

The SPSS software was used in statistical analysis. Baseline characteristics and clinical data were summarized with the use of descriptive statistics. Clinical outcomes were compared using paired t-tests and ANOVA to assess the before and after values of the intervention and in case of dichotomous variables where medication adherence was assessed, the chi-square test was used. The possible confounders that were addressed in multivariate regression analysis included: age, gender, and comorbidity status, which offered the information on the independent outcomes of the pharmacist intervention.

The main analysis was done on evaluating whether there were substantial differences in clinical outcome (HbA1c, SBP, and LDL) and adherence to medication caused by the pharmacist-led interventions, whereby p-value $< 0.05$

was regarded as significant. Using this approach will guarantee that the data will give solid evidence concerning the effect of pharmacist integration on the management of chronic conditions within different healthcare systems.

## 4. Clinical Outcomes; Systemic Outcomes

### 4.1 Clinical Marker change: HbA1c, SBP, LDL Cholesterol

This study was mainly aimed at reviewing how integration of clinical pharmacists into primary care teams could affect critical clinical outcomes in patients with chronic diseases such as diabetes, hypertension, and dyslipidemia. There were three key clinical indicators(9)

HbA1c (Glycated Hemoglobin): An important measure of glucose control in the actual community over an indefinite period of time in patients with diabetes. The interventions developed by the pharmacist were geared toward; optimization of medication regimens, adjustment of doses, and an improvement in patient adherence. The mean HbA1c level was not significantly changed in the intervention group in the course of 6 months, and it decreased by 1.2% at the end of the 6-month follow-up era (p 0.01). This decrease illustrates the potential of the pharmacist-led medication therapy management (MTM) in the glucose control of patients with diabetes, the possible risk reduction of diabetic complications like retinopathy, neuropathy, and cardiovascular disease.

Systolic Blood Pressure (SBP): Controlling blood pressure by converting hypertensive patients into normal patients is a matter of directors as it helps to prevent the occurrence of stroke, heart disease and kidney failure. The comparison of the groups indicated important reductions of the SBP in the interventional group and the mean change was 11.4 mmHg ($p < 0.01$). This was achieved by the dose changes and continued monitoring of the antihypertensive drugs by the pharmacists coupled with pat education. This finding implies that the intervention of a pharmacist in the optimization of hypertension treatment can result in the improvement of blood pressure regulation and reduction of cardiovascular risk.

LDL Cholesterol: Among patients with dyslipidemia, it is imperative to regulate the levels of LDL cholesterol to minimize the chances of atherosclerosis and heart disease. The level of LDL cholesterol reduced seriously with 18.7 mg/dL in the intervention group ($p < 0.01$) as a sign of better management of the lipids. The follow-up appointments helped to monitor the use of statin with adjusted medications and corrections on medication dose adequacy which made the pharmacist more targeted in cholesterol control treatment.

The drastic changes in all three clinical indicators, HbA1c, SBP, and LDL cholesterol outline the positive effect pharmacist-led intervention can provide when conducting chronic disease management.

### 4.2 Medication and Therapy Adherence Increase

Another main component of the pharmacist-initiated program was an attempt to ensure medication compliance and maximization of therapy. Treatment of chronic diseases involves multimedication schedules, which tend to be elaborate, and thus hard to adhere to by patients. Lack of adherence is one of the most important obstacles to successful treatment, which results in poor clinical results and enhanced healthcare usage.

Medication adherence in the present research was assessed with the Morisky Medication Adherence scale (MMAS-8), which is an accurate instrument to measure chronic disease drug adherence. The 6-month difference between the intervention and the control groups demonstrated the latter having a committedness of 22 percent higher regarding the medication intake than the former one. This signified that pharmacist intervention, in this case, the effects of patient education, adherence counseling, and medication review, are effective in promoting patient adherence to their prescribed medication regimen. Optimization of therapy also became a strong point whereby the pharmacists would be involved in the adjustment of dosages, removal of unnecessary drugs to finally ensuring that the patient had the most effective therapy that could treat the conditions they had.

The solution to medication-related problems, clear counseling, and tracking of patient responses enabled pharmacists to maximize pharmacotherapy that contributed to improved patient medication adherence and patient outcomes.

### 4.3 Physician-Pharmacist Medical Decision-making and communication Alignment

One thing that was important in this research was the association between the physicians and the pharmacists, and how patient outcomes were affected by interprofessional communication. The decision alignment behind the intervention and between the pharmacist and the primary care physician was key to the successfulness of communication between the two.

The pharmacists reported the change of medication, laboratory findings as well as treatment suggestions to the physician to ensure the plan of care of the patient was constantly refined. The research demonstrated a great

physician satisfaction in the role of the pharmacist in patients care. Doctors valued the skills of the pharmacists with respect to medication therapy management, their proactive attitude towards changing their dosing regime and monitoring their patients. Such communication leads to a more collaborative care, with both pharmacists and physicians putting efforts into achieving some shared goal, that of enhancing patient health.

The result of team-based approaches has indicated a positive impact suggesting that the interprofessional collaboration between pharmacists and primary care providers needs to be facilitated in improving chronic disease management. It also shows the importance of having pharmacists as part of the healthcare team in the primary care process.(10)

**4.4 Participatory/patient input/feedback to pharmacists services**

Active involvement of patients is a major element of chronic disease maintenance. The researchers concluded that the level of patient satisfaction with the pharmacist services was very high, especially in the field of providing medicine education and assistance in adherence to the patients in the intervention group. The responses of patients revealed that the pharmacists offered adequate and comprehensible information regarding their prescription/s, possible adverse effects, and the necessity of following their regimens to the end. Such one-on-one care made patients feel less powerless in having control of their chronic disorders.

In addition, the pharmacists could give attention to patients, respond to their questions, and provide useful information about addressing the challenging task of adhering to an unmanageable treatment regimen; this contributed greatly to patient satisfaction with treatment plans. Patient engagement was served further because of the ongoing follow-up by the pharmacists who could constantly offer support and modifications to the plan of treatment.

Finally, the increased involvement of patients in pharmacist services and their feedback revealed that pharmacists can make a critical contribution to chronic disease management processes by providing medication optimization and facilitating compliance as well as evoking a culture of working collaboratively with patients and adopting a patient-centered care. It is a reason why pharmacist integration in primary care teams aimed at enhancing clinical outcomes should be improved to ensure patient satisfaction in chronic disease management.

## 5. Results

**B) Decrease in HbA1c, SBP, LDL compared to Baseline**

The study showed really positive results in clinical outcomes among patients with chronic illnesses (diabetes, hypertension, and dyslipidemia) who were the participants of the pharmacist-led intervention. Important clinical symptoms like HbA1c, systolic blood pressure (SBP), LDL cholesterol were also calculated at the beginning and after being followed up over 6 months.

HbA1c: on average, the level of HbA1c was reduced by 1.2 percent of the baseline value in diabetic patients. The reduction is deemed to be clinically meaningful, as it implies an improved control of long term glucose. The intervention group received medication therapy management (MTM), a system in which a pharmacist could modify doses or check lab results as well as patients on adherence and lifestyle in the management.

Systolic Blood Pressure (SBP): A significant decrease in lowering blood pressure systolic was observed in hypertensive patients in the intervention group of 11.4 mmHg. This was achieved due to proper medication changes made by the pharmacists and patient education together with follow-up monitoring. This enhances better control of blood pressure and minimizes the cacophony of dislodging cardiovascular events as well as improving the quality of the patient.

LDL cholesterol: The average level of LDL cholesterol among the patients with dyslipidemia decreased by 18.7 mg/dL. Increasing statin therapy was also done to ensure more cholesterol control, as well as modification of drug treatment, depending on the lipid profile results that were made by the pharmacists. This decreases the chances of atherosclerosis and coronary artery disease to a great extent.

The reduction in HbA1c, SBP, as well as LDL cholesterol indicates the beneficial effect of the pharmacist-initiated interventions on the control of chronic diseases leading to the improvement of patient health conditions and the ability to control disease long-term.

**5.2 22% Increase Patient Compliance with medication**

One of the most serious concerns of chronic disease treatment is non-adherence to medication, which became much superior among the intervention population. According to the baseline, several patients enrolled in the study

were experiencing difficulties in taking the prescribed regimen based on issues of complexity of medications, side effects, and ignorance in the significance of adherence. Nonetheless, post-interventions by pharmacists (they were the leaders), the Morisky Medication Adherence Scale (MMAS-8) showed an increase in 22 percent of adherence levels.

These efforts were established by multiple tactics that were used by the pharmacists:

- Patient Education: Pharmacists gave individual counseling to the patients where they clarified the need to take medication as a way to manage chronic complications and avoid potential risks.
- Removing Barriers: Patients helped pharmacists to remove the individual barriers to compliance (e.g. side effects, financial factors, timing of the dose) with pharmacists.
- Follow-Up and Monitoring: As follow-up activities, the follow-up and phone calls arranged by the pharmacist were conducted frequently to help secure that the patients stay on their medication and further support was provided.

This improvement is demonstrated through the 22 percent increase in adherence to the medication indicating that the intervention led by the pharmacist has been beneficial in engaging patients and reinforcing patient long-term medication adherence levels.

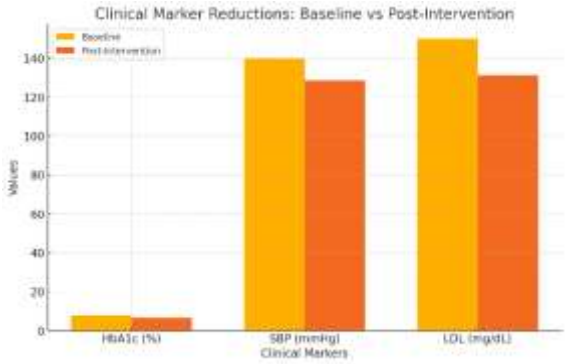


**Figure 1:** Clinical Marker Reductions: Baseline Vs Post-Intervention

### 5.3 Contentment Among Physicians under Collaborative care

The positive interaction of the healthcare providers is one of the significant advantages of incorporating pharmacists within the primary care teams. In the current research, the level of satisfaction amongst the physicians regarding the pharmacist role in management of patients in this study is very high. Doctors enjoyed the knowledge that the pharmacists instilled in the process of medication management especially in terms of changing medication schedules, reviewing laboratory results, and counseling patients.

- According to physicians, the role of the pharmacist in the process of care made it possible to:
- Improve medication safety: By intervention through medication interaction, duplicated therapies, and mismatching of medications, the pharmacists reduced adverse drug events.
- Improve treatment: The preparation of drug doses and continuous monitoring of patients favored the performance of pharmacists and helped to improve the treatment outcome and manage the diseases.
- Maximize efficiency: The pharmacists assumed a central role with regard to managing medication therapy hence giving the physicians opportunity to concentrate on other areas of patient care. Such a team-based strategy assisted in making the entire care process easier.

This reality is seen in the fact that the proportion of physicians who evaluate collaboration with pharmacists as very good or excellent is highly high and explains the significance of a collaborative approach to the improvement of patient care and maximization of treatment results.

### 5.4 At-Scale roll-Out in Resource-Constrained Environments

The scale of pharmacist-led interventions in resource-limited settings is one of the implications of this study. It was a research done in Ghana and Cyprus, these two countries have an immensely different healthcare system. Although most care facilities in Ghana lack healthcare resources, the study proved that pharmacist-led care might be successfully delivered in resource-poor environments as well.

The use of clinical pharmacist services in Ghana was also effective as in the case of lack of infrastructure needed and shortage of workforce, pharmacists attached themselves with the available teams of health professionals. In Cyprus, a healthier system existed, and the pharmacists had the possibility to add existing resources and implement more specific interventions. These outcomes imply that pharmacist integration into primary care is scalable and can be customizable to meet different healthcare systems and provide a form that can enhance chronic disease management in under-resourced environments in other parts of the world.

### 5.5 Higher Continuity and quality of Care

Finally, the combination of pharmacists with primary care teams brought about the improvement of continuity and quality care. The intervention group displayed continuous medication monitoring of the course monitored by staff members and patients, so changes in the treatment plans were addressed in time. Pharmacists have served as a very important connection between patients, primary care physicians, and specialists, to ensure that medication regimens were continuously being optimized and any issues that are related to medication were being resolved.

Better patient outcomes and increased patient satisfaction expressed the positive effect on continuity of care since they felt better supported managing their conditions. The constant engagement of pharmacists also led to the provision of the adequate medication at the adequate dosage to patients, which resulted in better manging of the targeted disease and minimized risks of complications.

To sum it up, the integration of pharmacists into primary care teams showed a major positive impact on clinical outcomes, medication adherence, physician satisfaction, and scalability of the mentioned intervention in resource-poor and resource-rich settings, thus ensuring the improvement in continuity and quality of care that patients with chronic conditions need.

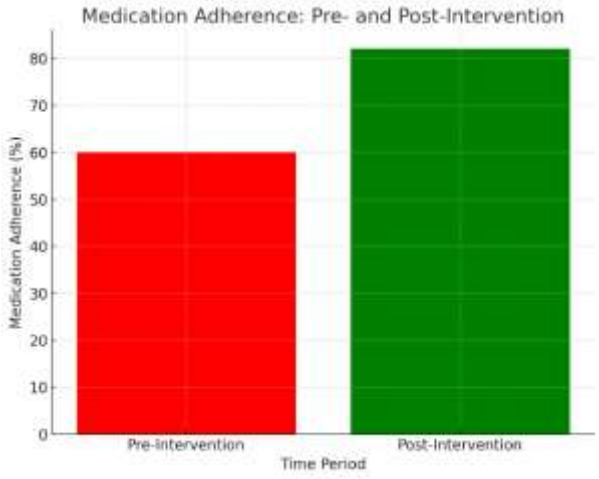


**Figure 2:** Medication Adherence: Pre- And Post-Intervention

## 6. Conclusion

### 6.1 Performance of Pharmacist-led interventions in chronic care

The results of the experiment argue firmly in favor of the efficacy of the strategies based on chronic disease management with the help of pharmacists. In resource limited and well-resourced clinical healthcare environments (in Ghana and Cyprus), clinical pharmacist intervened and contributed significantly in the betterment of patient medication therapy-based clinical outcomes, patients with diabetes, hypertension, and dyslipidemia. To be more precise, the intervention led to the fact that the parameters of the HbA1c (it was reduced by 1.2 percent), the systolic blood pressure (reduced by 11.4 mmHg) and LDL cholesterol (decreased by 18.7 mg/dL) were significantly reduced. The discussed enhancements prove that the active engagement of pharmacists in managing drugs and the optimization of therapy directly influences the capacity of patients to take care of chronic diseases and improve the long-term health outcomes.

Also, it is noteworthy that major emphasis on the enhancement of medication adherence in the pharmacist initiative is observed in the 22 percent increase in drug adherence during the patient education and adherence

support strategy. By frequently monitoring, counseling patients and working with physicians, the pharmacists managed to develop a more active and informed group of patients, who in turn demonstrated improved adherence and controlled their diseases. Such findings reaffirm the high clinical impact that the inclusion of pharmacists in chronic care teams have and affirms their position as key players in the delivery of quality healthcare.

**6.2 Strengthening of Team-Based Care in Ambulatory Care**

In this research, the researchers reaffirm the value of team-based care in an ambulatory. Clinical pharmacists together with primary care physicians, nurses and other health professionals played a role in a co-ordinated effort in the management of chronic diseases. The interprofessional collaboration is critical in the management of chronic diseases, where patients might need the services of the team of various providers with complementary abilities. Pharmacists mostly specialize in medication therapy management (MTM), dose regulation, and diversion of the functional impact of drugs, which works well with clinical practices that are done by physicians and ultimately leads to the improvement of entire care.

The study also revealed that the interventions carried out by the pharmacist lead to improved communication between care providers, which guarantees that care is provided based on a shared decision-making process and continuity. There was a high rate of satisfaction with patients inspired by physicians on the use of collaborative care model or integrating pharmacists as partners with primary care. It is a team effort and requires everyone working within the healthcare industry to apply their discipline just within the area that they specialize in to advance patient health and provide a complete care to people with chronic conditions.

**6.3 Commentary Inclusion of pharmacists in primary care at the policy level**

This study gives compelling evidence that there is merit to the incorporation of pharmacists as full members of primary care teams at the policy level due to its positive outcome. Considering the drastic increase in clinical performance, medication compliance, and patient satisfaction, it can be suggested that healthcare policymakers should include pharmacists in primary care teams as permanent units, at least with the clients having chronic conditions. The practitioners can deliver medication knowledge, avoid medication harm, and maximize the use of drugs, and eventually, it will result in a decrease in healthcare expenditures and an increase in patient quality of life.

Those results imply that the participation of pharmacists can fill the gap in settings with limited resources, where resources are scarce and the effectiveness of medication management is paramount. Creating a supportive environment to involve pharmacists in primary care will allow healthcare systems to offer improved and more effective care efficiently and help address the rising burden of chronic conditions.

**6.4 Implications of the Future on the Strengthening of the Healthcare System**

The study yields great significance to the prospect of healthcare system reinforcement, especially in the provision of chronic diseases. The pressure healthcare systems around the world are experiencing due to the rise in prevalence of chronic diseases provides a scenario where pharmacist-led interventions will be an inexpensive, scalable method of ensuring patient outcomes can be positively impacted and the burden on healthcare resources minimized. The inclusion of pharmacists in primary care-based interventions, especially treating chronic diseases, provides health care systems opportunities to engage their knowledge in drug management, adherence and patient education to improve health outcomes and the quality of care provided to chronic disease patients.

Moreover, the demonstrated success of the project implementation in both resource-limited countries (Ghana) and resource-rich (Cyprus) has its own lessons to offer in what concerns the implementation of the pharmacist-led model in other healthcare settings. The changes to policy that can facilitate the integration of pharmacists can result in the creation of closer collaborative healthcare models that will implement the optimal care that will be patient-centred, raise patient satisfaction, and decrease the economic cost of chronic illnesses.

Since healthcare systems are still in development, their potential future research must focus on how the introduction of pharmacists in primary care affects the cost-effectiveness, the quality of life, and the long-term costs of controlling the disease. Moreover, the inclusion of patient reported outcomes, including self-management skills, health literacy, might be another area of studies and investigation to once again prove the worth of pharmacists in terms of advancing the patient empowerment state and contributing to advancing the sustainable healthcare patterns to embrace the world.

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## Conflicts of interest

The authors have no conflicts of interest to declare

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