STRATEGIES TO IMPROVE MEDICATION ADHERENCE IN ADULT PATIENTS WITH HYPERTENSION IN PRIMARY CARE

by

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Abstract

Background: Hypertension affects 1.28 billion individuals globally and is one of the key public health issues in Canada impacting nearly one in four adults. Non-adherence to antihypertensive medications is a major contributor to uncontrolled hypertension and related complications.

Objective: To examine the strategies that can be used by primary care providers to improve medication adherence in adult patients with hypertension.

Methods: An integrative literature review approach (Toronto & Remington, 2020) was used along with the PRISMA guidelines (2021). A systematic search of CINAHL and Ovid MEDLINE was undertaken. A critical appraisal was conducted using two tools.

Results: Six studies met the inclusion criteria. Study designs included randomized controlled trials, observational cohorts, and mixed-methods studies from developed countries. Three key strategies were identified to improve medication adherence in adults with hypertension within primary care settings: patient-centered interventions (e.g., education tools, reminders, self-monitoring); collaborative care strategies involving pharmacists and nurses; and fixed-dose combination therapies.

Conclusion: Findings indicate that while several single strategies can support medication adherence in adults with hypertension, primary care providers should use a combination of strategies to achieve the most effective improvements in medication adherence and clinical outcomes.

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Glossary of Terms

Collaborative Care: A care strategy involving inter-professional collaboration, such as within nurse practitioners, physicians, pharmacists and nurses.

Hypertension: Defined as elevated blood pressure, with an average systolic blood pressure (SBP) above 135 mm Hg or diastolic blood pressure (DBP) above 85 mm Hg measured using Automated Office Blood Pressure.

Fixed-Dose Combination (FDC): Medications that include a combination of two or more antihypertensive agents into a single pill.

Medication Adherence: The patient's voluntary cooperation in taking medication as prescribed, including adherence to the timing, dose, and frequency of administration.

Nurse Practitioners (NPs): Health care professionals with graduate level of nursing education and advanced nursing practice competencies. NPs provide evidence-based healthcare, including diagnosing conditions, ordering diagnostic services, and prescribing and dispensing medications.

Patient-centered Interventions: Strategies that involve shared decision-making with patient and provide support responding to patient feedback about medication use, treatment goals, and medication-taking behavior.

Primary Care: A comprehensive approach to healthcare across all ages and stages of life, including prevention, health promotion, treatment, rehabilitation, and palliation.

Primary Care Providers (PCPs): Refers to family physicians or nurse practitioners in British Columbia (BC). PCPs deliver longitudinal care, routinely assess blood pressure, initiate pharmacological treatments, and coordinate referrals when necessary.

Strategies to Improve Medication Adherence in Adult Patients with Hypertension in Primary Care

Introduction and Background

Globally, hypertension is recognized as an epidemic that affects 1.28 billion people (World Health Organization, 2021). Hypertension is also a significant public health concern in Canada impacting nearly one in four adults (Bushnik et al., 2023). In British Columbia (BC), the age-standardized prevalence rate for hypertension was 22.5 per 100 people, and the age-standardized annual incidence rate was 20.2 per 1000 people over the age of 20 (Government of BC, 2024).

Hypertension is a significant risk factor for other conditions (e.g., cardiovascular disease, stroke, renal disease) and premature mortality (Bushnik et al., 2023; Choudhry et al., 2022). Hypertension contributes to nearly 50% of deaths related to cardiovascular disease and stroke, which are two leading causes of mortality in Canada (Bushnik et al., 2023). An urgent need for effective hypertension management remains to mitigate these consequences (Waked et al., 2019).

Effective hypertension management includes several essential components like lifestyle modifications (e.g., adopting the DASH diet, engaging in regular physical activity, managing weight, moderating alcohol consumption, stress reduction, and smoking cessation) and pharmacological treatment and medication adherence (Rabi et al; 2020). Medication adherence is one component of management in achieving optimal outcomes (Burnier & Egan, 2019). A high level of adherence to antihypertensive medications is difficult for various reasons (Zhou et al., 2024). Consequently, non-adherence to these medications is the primary cause of poor blood pressure (BP) control, leading to increased risk of complications including stroke, myocardial infarction, heart failure, chronic kidney

disease, and hypertensive retinopathy (Lee et al., 2022). I witness the devastating results caused by medication non-adherence among people with hypertension in my acute care nursing practice.

Hypertension is one common reason for people to visit primary care providers (PCP) like family physicians and nurse practitioners (NP) yet, unlike many conditions, hypertension is predominantly managed within these primary care settings rather than referral to specialists (Waked et al., 2019). Medication non-adherence in the context of hypertension contributes to poor clinical outcomes (Hamrahian, 2020), making it a significant concern for NP practice. The aim of this integrative literature review is to examine the strategies that can be used by PCPs to improve medication adherence in adult patients with hypertension.

Background

Overview of Hypertension

Uncontrolled Hypertension

Hypertension Canada (2024) reports that BP control rates in Canada remain suboptimal, with only two-thirds of Canadians having their BP controlled, and a renewed effort is required to optimize this control. A suboptimal control rate has profound health implications; uncontrolled hypertension affects nearly all organs in the body by causing damage at microvascular and macro vascular levels (Nadar & Lip, 2021).

Definition and Diagnosis

The Hypertension Canada Guidelines (Rabi et al., 2020) define hypertension as elevated BP measured using Automated Office Blood Pressure (AOBP), with an average systolic blood pressure (SBP) above 135 mm Hg or diastolic blood pressure (DBP) above

85 mm Hg, assessed using the most accurate technique. For patients with diabetes, the diagnostic threshold is lower, with hypertension confirmed if SBP is >130 mm Hg or DBP is >80 mm Hg (Rabi et al., 2020). For all patients, hypertension is diagnosed during the initial visit if AOBP SBP is >180 mm Hg or DBP is >110 mm Hg (Rabi et al., 2020). Moderate elevations during the initial visit, such as AOBP SBP 135-179 mm Hg or DBP 85-109 mm Hg, require out-of-office confirmation, including 24-hour ambulatory or home BP monitoring, to verify elevated readings and rule out white coat hypertension (Rabi et al., 2020).

Management

The Hypertension Canada Guidelines (Rabi et al., 2020) report that comprehensive management of hypertension includes lifestyle modifications such as regular moderate-intensity exercise, weight loss, DASH diet, reduced sodium intake, and limited alcohol consumption (Rabi et al., 2020). Pharmacological therapy is central for adults with average DBP >100 mm Hg or SBP > 160 mm Hg and strongly advised for those with DBP >90 mm Hg or SBP > 140 mm Hg with cardiovascular risks or target organ damage (Rabi et al., 2020). However, management recommendations vary internationally regarding optimal BP thresholds (Filippone et al., 2022).

Medication Adherence

Definition

Medication compliance is defined as the extent to which the patient's behavior matches the prescriber's recommendations (Mir, 2023). The term was later replaced with *adherence*, as *compliance* implies conformity to treatment recommendations, placing the blame for noncompliance solely on the patient and suggesting they are uncooperative or

untrustworthy (Ghosh et al., 2017). In contrast, *medication adherence* refers to the patient's voluntary cooperation in taking medication as prescribed, including adherence to the timing, dose, and frequency of administration (Zhou et al., 2024).

Patient adherence to medication is divided into three major phases: (1) initiation (starting the prescribed treatment), (2) implementation (consistently following the prescribed dosing regimen), and (3) persistence (continuing the treatment over the prescribed duration) (Choudhry et al., 2022). Failure at these phases constitutes non-adherence (Choudhry et al., 2022). Furthermore, medication adherence is a shared agreement between patients and clinicians (Chang et al., 2021). Adherence to long-term corrective medication in patients with hypertension is a crucial measure for reducing health consequences (Zhou et al., 2022)

Causes of Medication Non-Adherence

Causes of medication non-adherence are complex and multifaceted, influenced by unintentional and intentional factors (Jayasree et al., 2024). Unintentional non-adherence occurs when patients are committed to taking their medications but face barriers that are beyond their control (Jayasree et al., 2024). Unintentional barriers include individual capacity related to dexterity, memory, difficulty understanding instructions, difficulty managing complex regimens, or high costs (Lee et al., 2018; Singer et al., 2022). Provider and system-related barriers include communication gaps, healthcare access, and prescription issues (Lee et al., 2018).

In contrast, intentional non-adherence occurs when patients decide not to follow the prescribed treatment due to personal beliefs and experiences (Jayasree et al., 2024). Personal beliefs and experiences may include questioning the necessity of the medication,

feeling asymptomatic, and fearing side effects or concerns about dependency and depression (American Medical Association, 2023; Kleinsinger, 2018). These personal beliefs and experiences about illness and treatment are important, so what may seem puzzling from the provider's perspective is a rational response within the context of the patient's life (While, 2020).

Consequences of Medication Non-Adherence

Vrijens et al. (2017) reported that adherence issues are common in patients with hypertension, resulting in increased health risks (e.g., coronary and cerebrovascular events). Medication non-adherence is the primary cause of poor BP control, leading to increased risk of complications like stroke, myocardial infarction, heart failure, chronic kidney disease, and hypertensive retinopathy (Lee et al., 2022). Singer et al. (2022) argued that such adherence challenges are especially prevalent within primary care settings. Ultimately, medication non-adherence results in substantial health consequences, underscoring the need for targeted interventions in primary care (Vrijens et al., 2017).

Hypertension Management in the Context of Primary Care

Definitions of Primary Care and Primary Care Providers

Primary care is a comprehensive approach to healthcare across all ages and stages of life including prevention**,** health promotion**,** treatment**,** rehabilitation, and palliation **(**World Health Organization, 2022**).** Thousands of Canadians receive daily primary care services from NPs, family physicians, and other providers (e.g., nurses, dietitians, physiotherapists, and social workers) (Canadian Institute for Health Information, 2024). In BC, PCP refers to family physicians or NPs (Government of BC, 2024). The distinction is based on their responsibility for delivering longitudinal care, which involves the ongoing,

comprehensive management of a patient's health over time (Government of BC, 2025a). Other healthcare professionals listed above play critical roles in primary care teams but are not formally designated as PCPs within the provincial healthcare framework as their contributions often focus on specific aspects of patient care and are typically task-specific (Government of BC, 2025a).

Role of Primary Care Providers in Hypertension Management

Primary care providers manage hypertension by routinely assessing patients' BP, identifying risk factors, and implementing guideline-based protocols such as those recommended by Hypertension Canada and BC provincial guidelines (Government of British Columbia, 2024). Specifically, PCPs diagnose hypertension, initiate pharmacological treatments, and provide individualized counselling on lifestyle modifications (e.g., dietary changes, exercise, sodium reduction) to help patients achieve BP targets (Government of British Columbia, 2024; Rabi et al., 2020). Primary care providers also coordinate referrals to specialized care when complications or complex cases arise (Teh et al., 2020). Their longitudinal care helps provide continuous management along with fostering trust and improving communication, which strengthens the overall approach to hypertension management (Strumann et al., 2024).

However, PCPs face multiple challenges in hypertension management. Davis et al. (2024) reported that achieving recommended BP targets is complicated by the complexity of medication regimens, variability in patient adherence, and individual patient differences (e.g., medical comorbidities like metabolic syndrome). Parati et al. (2021) further emphasized that BP control may be suboptimal when its assessment is only based on AOBP values, and there is limited access to home monitoring; this hinders the ability to

obtain more accurate readings, which are critical for guiding treatment decisions. Primary care providers still remain well suited to potentially optimize hypertension management including medication adherence.

Methods

The approach for conducting and reporting this integrative review was informed by Toronto and Remington (2020) and PRISMA guidelines (2021). Critical appraisal was undertaken using two tools: (Mixed Methods Appraisal Tool [MMAT], 2018) and (Critical Appraisal Skills Programme [CASP], 2024).

Research Question and Objective

Research question: For adult patients with hypertension, what strategies can be used by primary care providers to improve patient medication adherence?

Research objective: To examine the strategies that can be used by PCPs to improve medication adherence in adult patients with hypertension.

Literature Sources: Search Strategy and Databases

The search strategy was developed using four key concepts to identify relevant literature (Appendix A): hypertension, adult population, medication adherence, and primary care. The final search strategy combined these four concepts using the Boolean operator AND: (“Hypertension” OR “high blood pressure” OR “essential hypertension”) AND (“adult patient” OR “middle-aged” OR “elderly” OR “18 years and older”) AND (“medication adherence” OR “medication compliance”) AND (“primary care” OR “family practice” OR “primary care physician” OR “Primary care Nurse Practitioners”.

Two databases were selected to search for this literature: CINAHL and Ovid MEDLINE. The search strategy was then executed in these two databases on October 29,

2024. Time limits were applied (January 1, 2016, through October 29, 2024) to ensure that the search captured the most current developments.

Literature Selection

Inclusion and exclusion criteria were developed to screen literature found in the two databases.

Inclusion Criteria

- Studies involving adult patients (>18 years) with essential or primary hypertension.
- Research conducted in primary care.
- Studies providing strategies to improve medication adherence or compliance.
- Studies published between January 1, 2016, and October 29, 2024.
- English-language publications, and
- Studies from developed countries.

Exclusion Criteria

- Studies involving pediatric populations.
- Research was conducted exclusively in non-primary care settings (e.g., hospitals).
- Studies that did not address medication adherence as a primary or secondary outcome.
- Studies published outside the defined date range.
- Non-English language publications.
- Studies from developing or underdeveloped countries.

Next, these inclusion and exclusion criteria were applied during the two-stage screening process to identify literature relevant to the research question and objective. There were no restrictions on study design, quality, and sex or gender differences. In the

first stage, titles and abstracts were screened against the inclusion and exclusion criteria for relevance, and duplicates were removed. Any title/abstract that was deemed relevant was advanced to the second stage. During the second stage, full text documents selected from stage one were reviewed using the inclusion and exclusion criteria.

Charting the Data and Critical Appraisal

Data were charted using an extraction table (Appendix B [Table 1]). The development and completion of this table facilitated critical appraisal of this literature which was charted in a table (Appendix B [Table 2]). The studies were rated on a scale of low, moderate, and high-quality evidence. Two tools were used to undertake this appraisal MMAT (2018) and CASP (2024).

Ethics

Ethics approval was not needed to conduct this integrative review because it is based on existing literature in the public domain.

Findings

A total of six research studies met the final inclusion criteria and were included in this review (Figures 1-2, Appendix B [Table 1], Appendix B [Table 2]). Of the six documents, three originated from the United States, while others were from the United Kingdom, Australia, and Italy. All these countries are developed, high-income nations. The earliest publication identified is by Levi et al. (2016) and the most recent is by Sarkar et al. (2024). All studies were peer-reviewed.

Five authors used quantitative methods whereas, one study was mixed-methods. Authors of these studies utilized various designs (e.g. randomized controlled trials (Chow et al., 2017; Kassavou et al., 2021; Sarkar et al., 2024), cohort [observational (Coe et al.,

2020), retrospective observational (Levi et al., 2016)], and mixed-methods (Yamane et al., 2020). Participants in the studies had hypertension including other medical comorbidities (e.g., diabetes, high cholesterol). There were a greater number of females/ women versus male/men participants in four of the studies. One study had more male participants than female, and another reported an approximately equal distribution between genders. None of the studies in this review specifically focused on NPs as primary care PCPs. None of the authors specifically reported on the inclusion of people with non-binary or diverse gender identities. Most participants were Caucasian.

Figure 1

PRISMA Flow Diagram

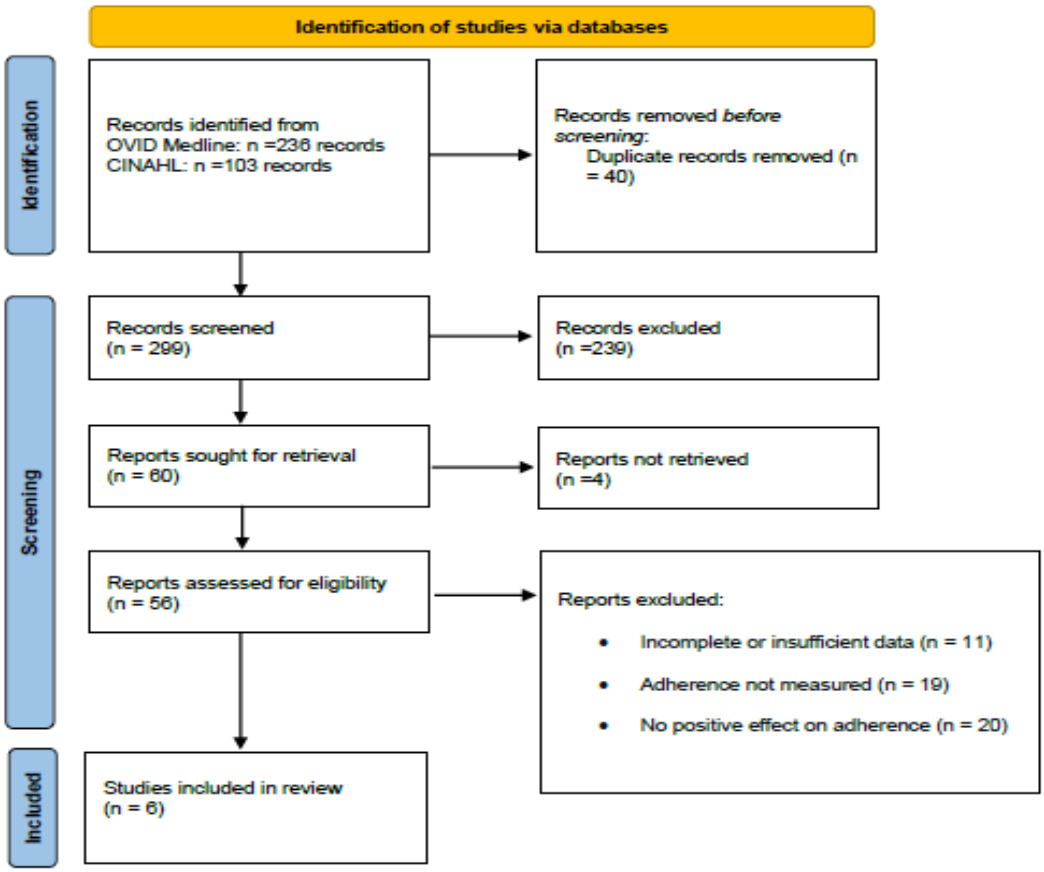
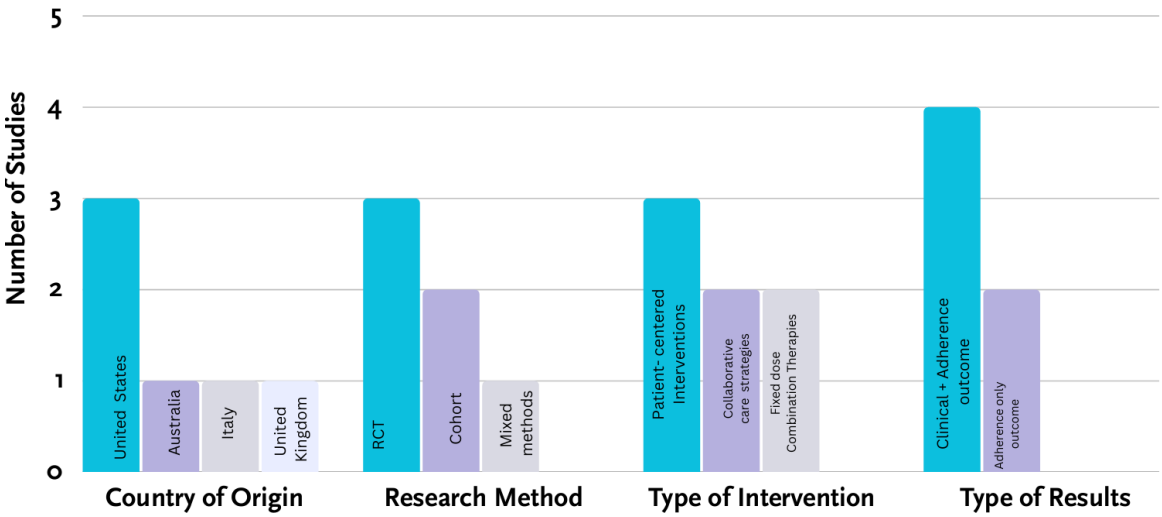


Figure 2

Features of Research Studies



The studies were critically appraised using the CASP (2024) and MMAT (2018) checklists. Critical analysis details like study strengths and limitations are presented in Appendix B (Table 2). Overall, the study recommendations offered various strategies that can enhance medication adherence in adult patients with hypertension. These strategies include patient-centered interventions, collaborative care strategies, and fixed dose combination (FDC) therapies.

Patient-centered Interventions

Tailored, patient-centered interventions emerged as effective strategies in three studies (Kassavou et al., 2021; Sarkar et al., 2024; Yamane et al., 2020). All three studies demonstrated that patient-centered strategies, such as educational tools, reminders, and self-monitoring, can improve medication adherence.

Yamane et al. (2020) explored the effectiveness of provider education combined with a personalized decision aid (PDA) in a mixed-methods study involving 24 non-adherent hypertensive patients. The paper-based PDA consolidated vital signs, laboratory results, lifestyle factors, and an atherosclerotic cardiovascular disease risk score into one document. By having all this information in one document, providers could quickly access data that would otherwise be spread across different areas of a paper chart. The patients could also easily visualize their progress on one document. The PDA also served as a prompt to discuss lifestyle modifications, smoking cessation, medication adherence, and regular follow-up visits. After three months, prescription refill rates were used to measure study outcomes and were found to increase from 79% to 96%. However, the small sample size and lack of a control group may limit the intervention's generalizability to the larger population.

Similarly, Kassavou et al. (2021) studied another tailored, patient-centered strategy using a randomized controlled trial (RCT) with 101 non-adherent, hypertensive patients. A nurse conducted a brief counselling session about medication adherence followed by an 84-day text messaging program customized using patient-reported information and practice records to address intentional and unintentional non-adherence. For intentional non-adherence, messages reinforced positive beliefs about taking antihypertensive medication (e.g., "Even if you do not feel different after taking your pills, you are keeping your blood pressure under control by taking them regularly" p.3), and negative beliefs were countered in a non-confrontational manner (e.g., "Your tablets support you in maintaining blood pressure control" p.3). For unintentional non-adherence, reminders were sent at scheduled times (e.g., "Do not forget to take your medication today: Ramipril, 2 tablets, 1.25 mg, at

16:00" p.3). Biochemically validated medication adherence was measured through urine samples after three months, and this showed a 20% improvement in the intervention group compared to the control group. A practice nurse who was blinded to group allocation recorded decreases of 9.16 mmHg systolic and 4.85 mmHg diastolic in the intervention group. Self-reported medication adherence was also assessed at baseline and followed up using a weekly adherence question ("How many days in the past week have you taken all your prescribed tablets?" p. 3). By the end of the trial, self-reported adherence improved by an average of one additional day per week in the intervention group compared to the control group (Kassavou et al., 2021).

Likewise, Sarkar et al. (2024) investigated a tailored, patient-centered approach through a RCT involving 200 low-income patients, each completing four primary care visits over six months. The intervention group received free home BP monitors, enabling them to measure and report four weekly readings at follow-up visits. Outcomes were measured by reductions in BP and scores on the 14-item Therapy Adherence Scale (TAS), developed by Kim et al. (2000), which covered three domains: sodium reduction, appointment keeping, and medication taking. Items were rated on a 4-point scale, with total scores ranging from 14 to 56. By the end of the study, the intervention group showed greater BP control (82% vs. 54%) and improved TAS scores, increasing from a mean of 38.7 to 42.6. The authors reported that among the three domains assessed by the TAS, medication adherence showed the greatest improvement in the intervention group and proposed that regular BP monitoring helps patients to remember and consistently take their antihypertensive medications.

Collaborative Care Strategies

In two studies (Coe et al., 2020; Kassavou et al., 2021), the collaborative care strategy was shown to improve medication adherence. In the RCT by Kassavou et al. (2021), the collaborative component involved nurses delivering brief counselling sessions. These sessions included advice on the importance of taking BP medication and help with signing up for digital support (either text messages or a phone app). This session was then followed by an 84-day text messaging program, which was found to improve biochemically validated medication adherence compared to the control group, and the results were statistically significant.

Coe et al. (2020), in their observational cohort study, examined the Michigan Pharmacists Transforming Care and Quality (MPTCQ) program (Choe et al., 2018), integrating primary care pharmacists into physician organizations (POs) to care for adults with chronic conditions, including hypertension. The MPTCQ program included two pharmacist cohorts across 17 participating POs. A total of 27 pharmacists took part, 17 in Cohort 1 and 10 in Cohort 2, and data was collected from pharmacist encounters over 27 months.

For hypertension management, pharmacists provided disease state management visits for 2,224 hypertensive patients in Cohort 1 (average of 1.9 visits per patient, 66% by phone) and 1,715 patients in Cohort 2 (average of 2.3 visits per patient, 57% by phone). The disease state management visits included medication therapy optimization, prescription adjustments, patient education, laboratory monitoring, motivational interviewing, and counselling on lifestyle modifications (Coe et al., 2020). Pharmacists identified medication adherence issues in 27% of Cohort 1 encounters and 21% in Cohort

2 and intervened with counselling, adherence aids, and medication adjustments. Blood pressure was measured at baseline and during follow-up visits (Coe et al., 2020). Authors reported that pharmacist interventions significantly reduced BP, with severe cases dropping to 30 mmHg (Coe et al., 2020). All surveyed patients agreed that pharmacists explained things clearly and helped them best use their medications (Coe et al., 2020).

Fixed Dose Combination Therapies

Two studies identified FDC therapies as effective for improving medication adherence, primarily by simplifying regimens and reducing pill burden (Levi et al., 2016; Chow et al., 2017). In a nationwide, population-based retrospective observational study conducted in Italy, Levi et al. (2016) analyzed over 1.2 million patient records of patients using a national medical database to compare adherence between patients prescribed a FDC (olmesartan/amlodipine in a single pill) versus the same components given as separate pills. Adult hypertensive patients with at least two years of medical history in the health database and a minimum of six months of follow-up were included in the study. The study used prescription records from general practitioners to measure adherence using the Proportion of Days Covered (PDC) method, which calculates how many days a patient had medication available during the follow-up period. Patients were grouped as having high (PDC ≥ 80%), intermediate (PDC = 40%–79%), or low (PDC < 40%) adherence. The results showed that 55.1% of patients who took the single-pill combination had high adherence, as compared to only 15.9% of those taking two separate pills. Even after adjusting for patient differences, those on the FDC pill were over six times more likely to be highly adherent. Given the large sample size and the use of valid, objective adherence measures, the study provided strong evidence that simplifying antihypertensive treatment

into a single-pill regimen can improve medication adherence and enhance health outcomes in adult patients with hypertension.

Similarly, Chow et al. (2017) studied combination therapy in a randomized, placebo-controlled, double-blind, crossover trial testing a "quad pill." The "quad pill" combined four common antihypertensive agents: irbesartan (37.5 mg), amlodipine (1.25 mg), hydrochlorothiazide (6.25 mg), and atenolol (12.5 mg), all at quarter doses in a single daily capsule. Although the sample size was small (21 participants) and the trial duration was short (4 weeks per treatment phase), 100% of participants achieved target office BP (<140/90 mm Hg) while on the "quad pill", as compared to just 33% on placebo. Participants also rated the "quad pill" as easy or straightforward to take, and all expressed willingness to continue using it, suggesting high acceptability.

Discussion

Six studies examined in this integrative review directly address the research question: *For adult patients with hypertension, what strategies can be used by primary care providers to improve patient medication adherence?* The studies highlight three strategies: (1) patient-centered strategies, including educational tools, reminder systems, and self-monitoring; (2) collaborative care strategies that involve nurses or pharmacists in ongoing management; and (3) FDC therapies that reduce pill burden. Each strategy in the studies showed measurable improvements and enhanced adherence, yet, the broader literature suggests that the most long-lasting improvements in adherence occur when these strategies are combined and tailored to individual patient needs. The subsequent passages in this findings section evaluates how each of these strategies aligns with and differs from findings in the broader literature.

Patient-Centered Interventions

Regarding the strategy of patient-centered interventions, authors of three studies in this review found that educational tools, reminders (e.g., via text messaging), and self-monitoring of BP can improve medication adherence (Kassavou et al., 2021; Sarkar et al., 2024; Yamane et al., 2020). Likewise, authors of two RCTs in broader evidence reported that educational tools in patient-centered interventions like personalized decision aids improved medication adherence (Wehkamp et al., 2021) and patients engaging in home BP monitoring displayed a lower incidence of non-adherence than controls (Zhang et al., 2021). The results of these studies align with previous research conducted by Thakkar et al. (2016), which found that patient-centered interventions such as text messaging nearly doubled adherence rates, especially when messages were personalized and interactive, and by Sarabi et al. (2016), which found that daily or weekly reminders significantly enhanced adherence.

Additional evidence available in literature outside this review suggests that the effectiveness of patient-centered interventions may be context-dependent and limited when implemented in isolation. For example, authors of a pragmatic RCT found that the impact of text message reminders diminished over 12 months (Ho et al., 2024). Gualtieri and Rosenbluth (2024) further suggested that this diminished impact on long-term adherence may be due to notification or alert fatigue that can occur because of the high volume of smartphone alerts. Additionally, a large RCT by Li et al. (2024) found that home BP monitoring was not associated with improved control instead, it was linked to poorer adherence among patients who held incorrect beliefs about antihypertensive treatment.

There is also a need for more research on patient-centered interventions, such as for those with limited health literacy (Richter et al., 2024; Stacey et al., 2025).

Collaborative Care Strategies

Regarding the strategy of collaborative care, authors of two studies in this review demonstrated that pharmacist and nurse-led interventions can improve medication adherence by recognizing related issues and implementing targeted supports like counselling and medication adjustments (Coe et al.,2020; Kassavou et al., 2021). Similarly, broader evidence, such as Santschi et al. (2021) found that a team-based model including pharmacists, nurses, and physicians improved medication adherence and reduced systolic BP after 12 months by 7 mmHg. Likewise, Kwakye et al. (2025) undertook a scoping review to find that 85% of the included studies reported improved medication adherence, with pharmacists involved in collaborative care models in most of those studies delivering the interventions.

However, some contrary studies do exist. For example, Bandiera et al. (2025) undertook a systematic review that assessed the impact of inter-professional collaboration between pharmacists and community health workers on medication adherence; they found limited evidence of effect on medication adherence. It is important to note that most of the methods used by studies in the Bandiera et al. (2025) review to evaluate medication adherence were subjective, relying on patient self-report. High-quality studies are needed better to assess the impact of such collaboration on medication adherence (Bandiera et al., 2025).

Fixed Dose Combination Therapies

Regarding the strategy of FDC therapies, authors of two studies in this review concluded that the use of medication combination helped simplify treatment regimens resulting in better medication adherence (Chow et al., 2017; Levi et al., 2016). A substantial amount of evidence in broader literature also supports FDC therapies. A large meta-analysis by Wei et al. (2023) including 61 studies found that patients on FDC therapies were 1.29 times more likely to adhere to treatment than those on free-equivalent combinations, underscoring the benefit of lowering pill burden. An et al. (2020) found in their systematic, narrative review that the use of FDC therapies reduce clinical inertia and are generally safe. The American Heart Association Clinical Guidelines (2018) by Whelton et al. also recommend initiating antihypertensive therapy with FDC therapies due to their association with improved adherence and treatment outcomes (Derington et al., 2023).

In contrast, DiPette et al. (2018) reported that limited use of FDC therapies remains due to cost and other barriers like the small number of preferred combinations listed on formularies, limited availability of combinations, difficulties adjusting doses, and the lack of scored tablets for dose flexibility. In BC, Pharma Care (BC's provincial drug coverage program) does not automatically cover all combinations (Government of British Columbia, 2025b). Newer or less commonly prescribed medications require Special Authority Approval before they are eligible for coverage (Government of British Columbia, 2025b).

Overall, the results highlight that the effectiveness of these strategies can vary depending on patient context and implementation. For example, single-strategy approaches can fail to produce meaningful or lasting improvements in medication adherence (Pinho et

al., 2021) whereas, a combination of these strategies has shown to significantly improve adherence (Maniki et al., 2024). A broad range of strategies could help address diverse barriers to medication adherence (Pinho et al., 2021). Hypertension Canada (2025) also recommends a coordinated, multi-pronged approach individualized to patient needs when optimizing adherence to antihypertensive therapy.

Implications for Nurse Practitioner Practice

Although none of the studies in this review specifically focused on NPs as primary care PCPs, the findings support a multi-pronged approach to improving medication adherence, which aligns with the BCCNM (2024) *Entry-Level Competencies for Nurse Practitioners.* As clinicians, NPs can implement evidence-based strategies like patient-centered tools, FDC strategies, and engage in collaborative care (Competencies 1.6b; 1.6d; 1.9a). In the leadership role, NPs can support the prioritization of medication adherence strategies into health system planning through policy development and resource stewardship (Competencies 2.1g; 2.3a). As advocates, NPs can address system-level barriers to adherence and promote equitable access to relevant strategies based on diverse patient populations (Competencies 3.4a; 3.5b). In the educator role, NPs may promote health literacy initiatives that help patients with medication adherence (Competencies 4.1b; 4.2a). Lastly, as scholars, NPs can contribute to research by developing and evaluating the effectiveness of NP-led medication adherence strategies with the goals of informing future policy and clinical practice (Competencies 5.1a; 5.2e).

Limitations

This integrative review has some limitations. Two tools CASP (2024) and MMAT (2018) were used to critically appraise the six studies, it is possible that other reviewers

may interpret the quality of these studies differently. A comprehensive, systematic search strategy was used to summarize and synthesize six studies; however, not all relevant literature may be identified due to the small scope of this student project. For example, the search was limited between 2016 and 2024. As a result, there is potential for missed evidence such as earlier high-quality studies which may have contributed to a better understanding of adherence strategies. In addition, studies from underdeveloped or developing countries were not included. This exclusion limits the generalizability of the findings, as strategies effective in high-income countries may not translate to settings with different healthcare infrastructures.

Conclusion

Hypertension is a leading global health concern, associated with increased risks of cardiovascular disease, stroke, and renal disease (Lee et al., 2022). In Canada, there is suboptimal BP control among adults with hypertension (Hypertension Canada, 2024). Medication non-adherence is the primary cause of poor BP control (Lee et al., 2022). Hypertension is primarily managed in primary care settings in Canada by PCPs (Waked et al., 2019). Therefore, an integrative review was conducted to identify targeted strategies that PCPs can use to enhance medication adherence in adult patients with hypertension. Systematic searches of CINAHL and Ovid MEDLINE, guided by PRISMA and Toronto and Remington's (2020) framework were conducted, six peer-reviewed studies from developed countries were identified and critically appraised using CASP (2024) and MMAT (2018).

This integrative review identified three key strategies for improving medication adherence in adult patients with hypertension: patient-centered interventions (such as

education tools, reminders, and self-monitoring), collaborative care strategies (involving multidisciplinary teams), and FDC therapies. While each strategy demonstrated effectiveness, comparing the strategies with the literature outside this review showed that single-strategy approaches may have a limited long-term impact. The results of this review, when interpreted within the broader evidence, support a multi-pronged, individualized approach to address intentional and unintentional medication non-adherence in adult patients with hypertension in primary care.

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Appendices

Appendix A: Database Rationale and Systematic Search Strategy

CINAHL was chosen because of its extensive coverage of nursing and allied health literature (Dhippayom et al., 2023). CINAHL is also an essential database for reviews of qualitative studies of health service intervention (Dhippayom et al., 2023). This database has been found to provide many unique studies related to health service intervention that may not be indexed in other primary databases (Dhippayom et al., 2023). Ovid MEDLINE was included to capture a broader range of biomedical and clinical literature addressing hypertension and its management (Wolters Kluwer, n.d.).

For the concept of hypertension, both controlled vocabulary and free-text keywords were used to identify studies. For example, in Ovid MEDLINE, the exploded Mesh Heading (MH) "Hypertension" was combined with free-text terms such as "high blood pressure," "essential hypertension," and "arterial hypertension". In CINAHL, similar strategies were used with subject headings (e.g., SH "Hypertension+") and keywords. Combining these terms with the Boolean operator OR ensured that studies using varying terms for hypertension were captured.

Mesh Headings such as MH "Adult+" and free-text terms such as "adult patient," "middle-aged," "elderly," "older adults," and "18 years and older" were used to ensure that studies focused on adult patients. In both databases, these terms were combined with Boolean operator OR to maximize sensitivity to the adult population.

Medication adherence was identified using a controlled vocabulary (e.g., MH "Medication Compliance" in CINAHL and the corresponding MH in Ovid MEDLINE) as well as free-text terms such as "medication adherence" and "medication compliance." The

term “medication compliance” was also included in the search strategy as historically it was the word used for medication adherence (Ghosh et al., 2017). Using both terms increased the likelihood of retrieving studies that discussed adherence, whether the exact term was indexed or not.

To capture studies set in primary care, terms related to this area were used. In CINAHL, subject headings such as MH “Primary Health Care,” MH “Primary Care Nurse Practitioners,” and MH “Physicians, Family” were combined with free-text terms like “primary care,” “family practice,” and “primary care physician.” In Ovid MEDLINE, a similar approach was taken using the appropriate MH terms. The Boolean operator OR was used to combine these terms.

Figure 3

CINAHL Search strategy

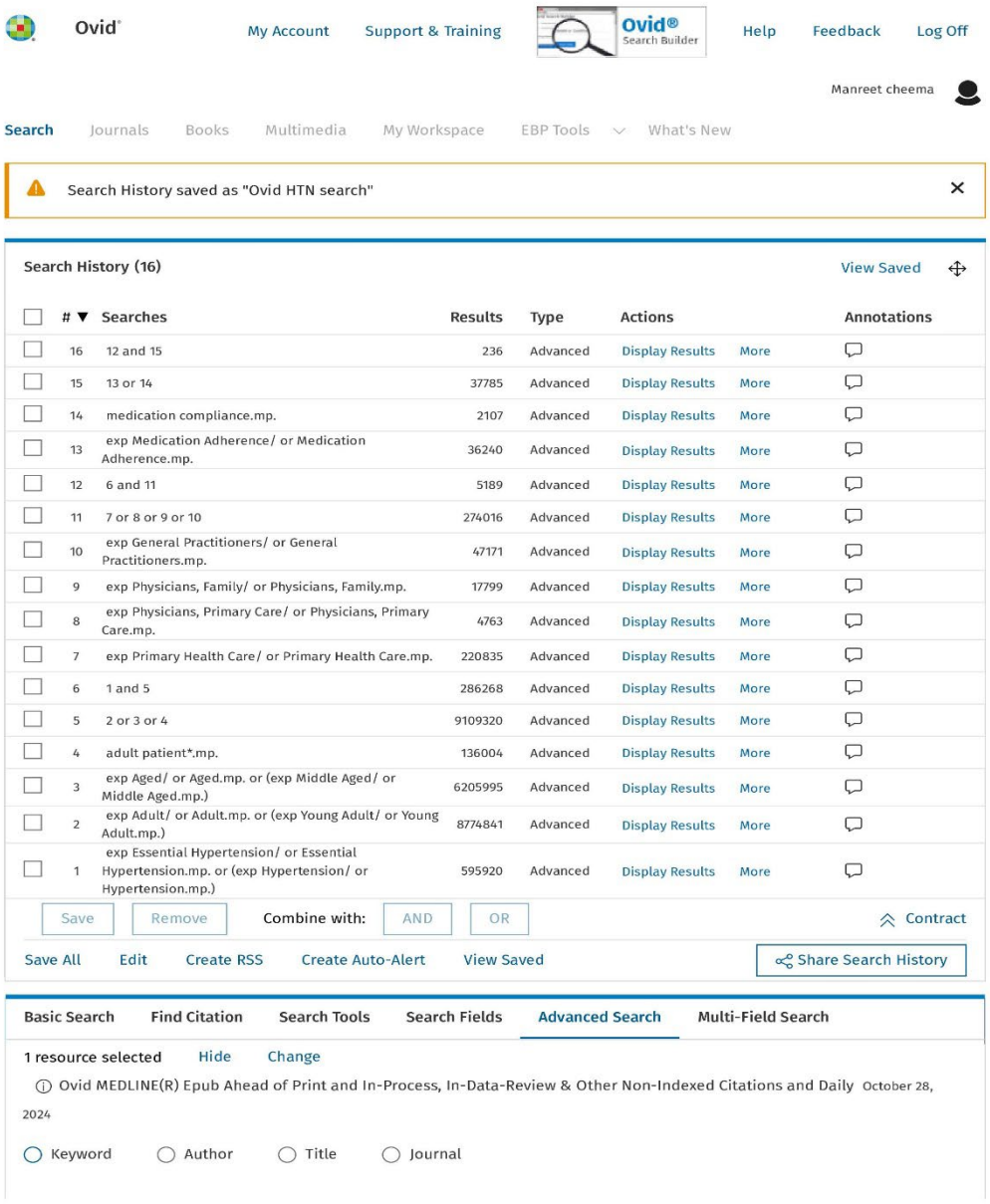
Tue, October 29, 2024 1:23:54 PM

#	Query	Limiters/Expanders	Last Run Via	Results
S14	S12 AND S13	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	103
S13	(MH "Medication Compliance") OR "medication adherence or medication compliance"	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	24,755
S12	S5 AND S11	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	1,330
S11	S6 OR S7 OR S8 OR S9 OR S10	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	112,604
S10	(MH "Primary Health Care") OR "primary health care"	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	82,070
S9	"gp"	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	26,103
S8	"general practitioner"	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced	19,811

			Search Database - CINAHL Complete	
S7	"primary care physicians or primary care doctors" OR (MH "Physicians, Family")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	24,171
S6	(MH "Primary Care Nurse Practitioners") OR "primary care providers or primary care clinicians or primary care practitioners"	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	246
S5	S1 AND S4	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	44,208
S4	S2 OR S3	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	2,123,513
S3	"adult patients"	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	36,302
S2	(MH "Adult+") OR (MH "Young Adult") OR "adults or adult or aged or elderly" OR (MH "Aged+")	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	2,112,415
S1	(MH "Hypertension+") OR "hypertension or high blood pressure or elevated blood pressure or htn or hypertensive"	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	94,730

Figure 4

Ovid MEDLINE Search Strategy



Appendix B: Literature Matrix

Table 1

Data Extraction Table

Study	Objective	Study	Population	Intervention	Key Findings
Author: Chow et al., 2017 **Country:** Australia **Journal:** The Lancet. **Title:** "Quarter-dose quadruple combination therapy for initial treatment of hypertension: placebo-controlled, crossover, randomized trial and systematic review".	To assess the efficacy, tolerability, and potential clinical benefits of ultra-low-dose combination therapy (Quad pill) in improving blood pressure control.	**Type:** Quantitative study **Design:** Randomized, double-blind, placebo-controlled, crossover trial	**Sample size**: 22 **Type of Sampling:** Convenience Based (adults with untreated hypertension recruited from four community centers in western Sydney, NSW in general practices). **Gender Considerations**: Males 48% and females 52%	Quad pill: single capsule containing four blood pressure-lowering medications at quarter doses (irbesartan, amlodipine, hydrochlorothiazide, and atenolol) was the intervention. Participants received both the quad pill and placebo for 4 weeks each, with a 2-week washout in between. Participants completed assessments at baseline, weeks 4, 6, and 10 weeks.	**Type of Results** • Clinical outcomes and Patient-reported outcomes **Findings** • Significant reduction in 24-hour systolic BP by 18.7 mmHg in the intervention group compared to control group. • 24-hour diastolic BP reduction by 14.2 mmHg in intervention group compared to control group. • All participants achieved office BP <140/90 mmHg on the Quad pill compared to 33% on placebo. • High medication adherence and patient acceptability were reported.

Study	Objective	Study	Population	Intervention	Key Findings
Author: Coe et al., 2020 **Country:** United States **Journal:** Journal of Managed Care & Specialty Pharmacy **Title:** "Pharmacists providing care in statewide physician organizations: findings from the Michigan Pharmacists Transforming Care and Quality Collaborative" . **Funding:** Blue Cross Blue Shield of Michigan Collaborative Process Initiative	To evaluate the Michigan Pharmacists Transforming Care and Quality (MPTCQ) program's process outcomes, clinical impact, patient satisfaction, and sustainability of pharmacists in primary care.	**Type:** Quantitative **Design:** Observational cohort study.	**Sample size:** 9,000 patients across two cohorts. **Type of Sampling:** Purposive sampling (adults with chronic conditions such as diabetes, hypertension, and hyperlipidemia were referred by physicians or identified through registry reviews within 17 participating physician organizations in the MPTCQ program in Michigan). **Gender Considerations**: 56% Females in cohort 1 and 47% Females in cohort 2.	• Pharmacists allowed to initiate, adjust, and discontinue medications. • Pharmacists used a structured intervention workflow that included motivational interviewing, adherence aids, and patient education. • The intervention emphasized optimizing medication therapy.	**Type of result:** • Clinical outcome and Adherence outcome **Findings:** • Significant reductions in systolic blood pressure (up to 30 mmHg in severe cases) • Medication adherence problems identified and addressed in 27% in cohort 1 and 21% of cohort 2 encounters.

Study	Objective	Study	Population	Intervention	Key Findings
Author: Kassavou et al., 2021 **Country:** United Kingdom **Journal:** Scientific Reports **Title:** The feasibility of PAM intervention to support treatment-adherence in people with hypertension in primary care: a randomized clinical controlled trial **Funding:** National Institute for Health Research	To evaluate the feasibility and potential effectiveness of the Programme on Adherence to Medication (PAM) intervention in improving medication adherence and reducing blood pressure in hypertensive patients.	**Type:** Quantitative **Design:** Randomized Clinical Controlled Trial	**Sample size:** 101 participants **Type of Sampling:** Purposive sampling (adults with hypertension and medication non-adherence identified from electronic medical records by general practitioners). **Gender Considerations**: 54% Males and 46% females.	• Intervention consisted of two components. • First component included a Very Brief Intervention (VBI) delivered by a practice nurse who did a short face-to-face session with the patient, explained the importance of taking blood pressure medication, and helped them sign up for digital support (either text messages or a phone app). • The second component included digital intervention that included 3 months of tailored digital support through text messages or a smartphone app, providing reminders, reinforcing positive beliefs, and countering negative beliefs.	**Type of Result:** Clinical outcome and Adherence outcome. **Key Findings** • Biochemically validated medication adherence improved by 20% compared to control. • Reduced systolic blood pressure by 9.16 mmHg and diastolic by 4.85 mmHg. • Improved lipid profiles (cholesterol, LDL, triglycerides) and glycated hemoglobin (HbA1c) in patients with comorbidities. • Demonstrated high feasibility with 100% uptake and 72% sustained engagement.

Study	Objective	Study	Population	Intervention	Key Findings
Author: Levi et al., 2016 **Country:** Italy **Journal:** Journal of Managed Care & Specialty Pharmacy **Title:** "Patient Adherence to Olmesartan/Amlodipine Combinations: Fixed Versus Extemporaneous Combinations". **Funding:** Menarini Farmaceutici Riuniti	To evaluate and compare the adherence levels between the fixed-dose combination (FDC) of olmesartan/amlodipine and the extemporaneous (two-pill) combination of the same drugs in adult hypertensive patients in a real-world primary care setting in Italy. The goal was to assess whether the FDC improved adherence to antihypertensive therapy.	**Type:** Quantitative **Design:** Observational, Retrospective cohort design	**Sample size:** 6,612 patients **Type of Sampling:** Population Based (adults diagnosed with hypertension were identified through a population-based general practice database in Italy. Patient exposure to the drugs was obtained from the prescription records of GPs and included patients treated with either the fixed-dose combination of olmesartan/amlodipine or an extemporaneous combination of the same drug components, with at least 2 years of medical history and 6 months of follow-up data). **Gender Considerations:** • FDC Group: 52.2% female • Extemporaneous Combination Group: 50.8% female	Intervention: • Fixed-Dose Combination (FDC): a single-pill combination of olmesartan and amlodipine at varying dosages (20/5 mg, 40/5 mg, or 40/10 mg) with a 6 month follow up period. Comparator: • Extemporaneous Combination: olmesartan and amlodipine as separate pills, requiring the concurrent use of both medications with a 6 month follow up period. • Medication adherence using the Proportion of Days Covered (PDC) over a 6-month follow-up period.	**Type of Results:** Adherence only outcome (prescription data). **Key Findings:** • The study found that 55.1% of patients in the fixed-dose combination (FDC) group achieved high adherence 80% compared to 15.9% in the extemporaneous combination group. • Patients in the FDC group were 6.65 times more likely to be highly adherent (odds ratio = 6.65).

Study	Objective	Study	Population	Intervention	Key Findings
Author: Sarkar et al. 2024 **Country:** United States **Journal:** The Journal of the American Board of Family Medicine **Title:** "Empowering Low-Income Patients with Home Blood Pressure Monitors to Improve Hypertension Control". **Funding:** Texas Academy of Family Physicians Foundation, Texas Medical Association Foundation, and Harris County Hospital District Foundation.	To evaluate whether providing free home blood pressure monitors improves hypertension control and therapy adherence, as measured by the Therapy Adherence Scale (TAS), focusing on three domains: medication adherence, dietary adherence (reducing sodium intake), and appointment keeping, among low-income, underserved patients.	**Type:** Quantitative **Design:** Prospective Randomized Controlled Trial	**Sample Size:** 200 participants **Type of Sampling:** Convenience Based (low-income, uninsured, and underserved adults with uncontrolled hypertension in a community health center in Texas). **Gender Considerations**: 60% female and 40% males.	• Participants in the intervention group used the monitors to record and report their BP readings (four times weekly) during four primary care visits (two in-person and two virtual) over six months. Physicians used these readings to guide hypertension management. • Both groups received standard care, including pharmacologic and non-pharmacologic counseling, but the comparison group did not have access to home BP monitors during the study period	**Type of Results:** Clinical Outcome and Adherence outcome. **Key Findings:** • 82% of the participants in the intervention group achieved BP control compared to 54% in the control group. • Therapy Adherence Scale scores were higher in the intervention group. • The exact measurement of medication adherence improvement was not reported in the study. However, it was noted that among the three domains assessed by the Therapy Adherence Scale, medication adherence showed the greatest improvement in the intervention group.

Study	Objective	Study	Population	Intervention	Key Findings
Author: Yamane et al., 2020 **Country:** United States **Journal:** Nursing Forum **Title:** "Assessment of a patient-centered initiative to improve hypertension management for adults with comorbid type 2 diabetes at a free clinic in the rural south". **Funding:** No funding information was provided in the article.	To evaluate the impact of a patient-provider education program and decision aid on improving patient knowledge, medication adherence, provider guideline adherence, and communicatio n in managing hypertension and type 2 diabetes.	**Type:** Mixed-methods **Design:** Prospective mixed-methods	**Total Participants:** 24 **Type of Sampling:** convenience Based (adults aged 18 and older with diagnosed with comorbid hypertension and type 2 diabetes mellitus that are receiving care at the chronic care clinic in a free clinic setting). **Sex Distribution:** Female: 79% Male: 21%	Multifaceted intervention including: • Patient education (quiz-based and focused). • Provider education • Use of a decision aid (DA) to facilitate. communication and guideline-based care.	**Type of Results:** Adherence only outcome. **Key Findings:** • The study found significant improvements in patient knowledge, with quiz scores increasing from 60% to 93%. • Medication adherence also improved, with prescription refill rates rising from 79% to 96%. • Communication between providers and patients was enhanced, with 72% of patients reporting active engagement in shared decision-making and 76% expressing confidence in the treatment's effectiveness.

Table 2

Critical Appraisal Table

Study	Strengths	Limitations	Relevance to Research Question	Quality of Evidence
Chow et al., 2017	• Novel quad pill strategy achieved significant blood pressure reduction with high adherence and minimal side effects. • Crossover design minimized variability, increasing statistical power.	• Small sample size and short follow-up (10 weeks) limit generalizability and long-term safety assessment. • Conducted in a single region with untreated individuals, reducing population diversity.	Demonstrates the efficacy of a simplified treatment regimen using a quad pill, which combines four antihypertensive agents at low doses. High adherence rates, minimal side effects, and significant blood pressure reductions highlight the potential of this approach to improve patient adherence and outcomes.	CASP: Moderate Quality
Coe et al., 2020	• large-scale study including over 24,000 pharmacist-patient encounters across 17 physician organizations. • Used real-world data collected from routine primary care settings, which increases the relevance to everyday practice. • improved outcomes in medication adherence and blood pressure. • Sustainability of the intervention, shown by the fact that most organizations chose to retain their pharmacists even after the external funding ended.	• No control group which makes it harder to isolate the pharmacists' effect. • Data self-reported by pharmacists, which could introduce bias.	Evaluates pharmacist interventions within primary care settings, focusing on medication management and patient outcomes, including adherence and clinical measures like blood pressure control. Highlights on the collaborative care model, demonstrating how integrating pharmacists into primary care can enhance medication adherence.	CASP: High Quality
Kassavou et al., 2021	• Clearly defined research question. • Appropriate randomization and low attrition. • Robust outcome measures, including biochemical validation.	• Lack of blinding for participants and investigators. • Short trial duration (3 months).	Findings highlight that digital health interventions can improve medication adherence in adults with hypertension.	CASP: High Quality

Study	Strengths	Limitations	Relevance to Research Question	Quality of Evidence
	• Feasible and cost-effective intervention.			
Levi et al., 2016	• Large sample size and robust database. • Valid and objective adherence measurement.	• Short follow-up period. • Lack of direct clinical outcome measures.	These findings highlight that simplified regimens, like FDCs, can enhance patient adherence in antihypertensive therapy and suggest their early use in treatment when monotherapy fails, so as to improve adherence.	CASP: High Quality
Sarkar et al., 2024	• Clear research question with defined PICO elements. • Randomized allocation and comprehensive outcome reporting. • Significant results showing intervention effectiveness.	• Lack of blinding for participants, investigators, and outcome assessors. • Small sample size due to funding limitations.	The study evaluates the use of free home blood pressure monitors to improve medication adherence in adults with hypertension.	CASP: High Quality
Yamane et al., 2020	• Mixed-methods approach provides comprehensive insights. • Cost-effective for resource-limited settings.	• Limited by small sample size. • Short duration prevented long-term assessment of outcomes.	The intervention in the study addresses key barriers to adherence, such as poor knowledge, communication gaps, and guideline adherence by integrating patient-centered education, provider training, and decision aids.	MMAT: Moderate Quality