

A systematic review of interventions to improve medication adherence in family medicine patients

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Abstract

Background: Medication non-adherence poses a significant challenge in healthcare, leading to suboptimal treatment outcomes. This systematic review aims to evaluate the effectiveness of different interventions in improving medication adherence.

Methodology: A comprehensive search was conducted to identify relevant studies. Inclusion criteria encompassed interventions targeting medication adherence and reporting quantitative measures of adherence outcomes. The selected studies were assessed for quality, and data were extracted for analysis.

Results: The review included a total of 14 studies. Interventions involving tailored phone calls or educational materials did not yield significant improvements in medication adherence. Conversely, interventions such as face-to-face counseling sessions and self-management programs showed promise in improving adherence. Nurse-led interventions and pharmacist-led consultations did not demonstrate significant improvements. Similarly, interventions involving stroke physician specialist assessments, behavioral feedback, medication reviews, and motivational interviewing did not yield significant improvements. A pooled analysis of various interventions across different healthcare settings showed a moderate but not statistically significant difference in medication adherence.

Conclusion: The findings from this systematic review suggest that interventions tailored to individual patient characteristics and involving personalized support and education show promise in improving medication adherence. However, interventions relying solely on tailored phone calls, educational materials, nurse-led care, pharmacist-led consultations, stroke physician specialist assessments, behavioral feedback, medication reviews, or motivational interviewing may not consistently improve adherence.

Keywords: Medication Adherence, Patient Compliance, Family Medicine, Education, Behavioral Modification.

Introduction

Medication adherence, which is defined as the extent to which patients take their drugs as prescribed by medical practitioners [1–3], is a crucial aspect in achieving optimal health results. In numerous healthcare settings, including family medicine, poor adherence to prescription regimens is a prevalent and persistent problem [4–6]. Non-adherence to prescribed prescriptions poses major difficulties for patients, healthcare professionals, and healthcare systems, resulting in increased healthcare expenses, treatment failure, disease progression, and avoidable hospitalizations [7,8].

In family medicine, where primary care physicians play a crucial role in managing patients' overall health and wellbeing, medication adherence is of the utmost significance [9]. Medication adherence concerns can be effectively addressed in family medicine settings, which frequently serve as the patients' primary point of contact and offer complete and continuous care. In recognition of the importance of non-adherence on patient outcomes, several interventions have been designed and deployed to enhance drug adherence among family medicine patients [10,11].

This review seeks to provide an exhaustive evaluation of strategies targeted to improve drug adherence in family medicine settings. By carefully examining and integrating the existing evidence, this review tries to identify effective techniques and treatments that family medicine practitioners can apply to increase patient medication adherence.

This review is significant because it has the potential to inform clinical practice, policymaking, and future family medicine research endeavors. By finding effective interventions, healthcare professionals can integrate evidence-based practices into their everyday practice, resulting in improved patient outcomes. In addition, policymakers can use the findings of this analysis to develop and implement programs and policies that improve drug adherence in family medicine settings.

Methodology

1. Study Design:

This systematic review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure transparent reporting and rigorous methodology.

2. Search Strategy:

A comprehensive search was conducted to identify relevant studies. Electronic databases, including PubMed, Embase, Cochrane Library, Google Scholar, and websites were searched using a combination of relevant keywords and Medical Subject Heading (MeSH) terms including (Patient Compliance OR Medication Adherence) AND (Family Practice OR Primary Health Care) AND (Patient Education as Topic OR Reminder Systems OR Health Behavior OR Self Care OR Counseling OR Motivational Interviewing OR Health Knowledge, Attitudes, Practice OR Professional-Patient Relations OR Telemedicine OR Mobile Applications OR Medication Systems, Reminder OR Pharmaceutical Preparations/administration & dosage). The search strategy was developed in consultation with a medical librarian or information specialist to ensure accuracy and completeness.

3. Study Selection:

Two independent reviewers screened the retrieved articles for eligibility. Initially, titles and abstracts were screened based on predetermined inclusion and exclusion criteria. Full-text articles were obtained for potentially eligible studies. The reviewers assessed the full-text articles for final inclusion, resolving any discrepancies through discussion or consultation with a third reviewer, if necessary. The reasons for study exclusion were documented.

4. Inclusion and Exclusion Criteria:

The inclusion criteria for this review are as follows:

- Interventions targeting medication adherence.
- Studies reporting quantitative or qualitative outcomes related to medication adherence rates or patient perceptions.
- Studies published in English.

The exclusion criteria are as follows:

- Studies conducted in settings other than family medicine.
- Interventions not specifically targeting medication adherence.
- Studies not reporting outcomes related to medication adherence rates or patient perceptions.
- Studies not published in English.

5. Data Extraction:

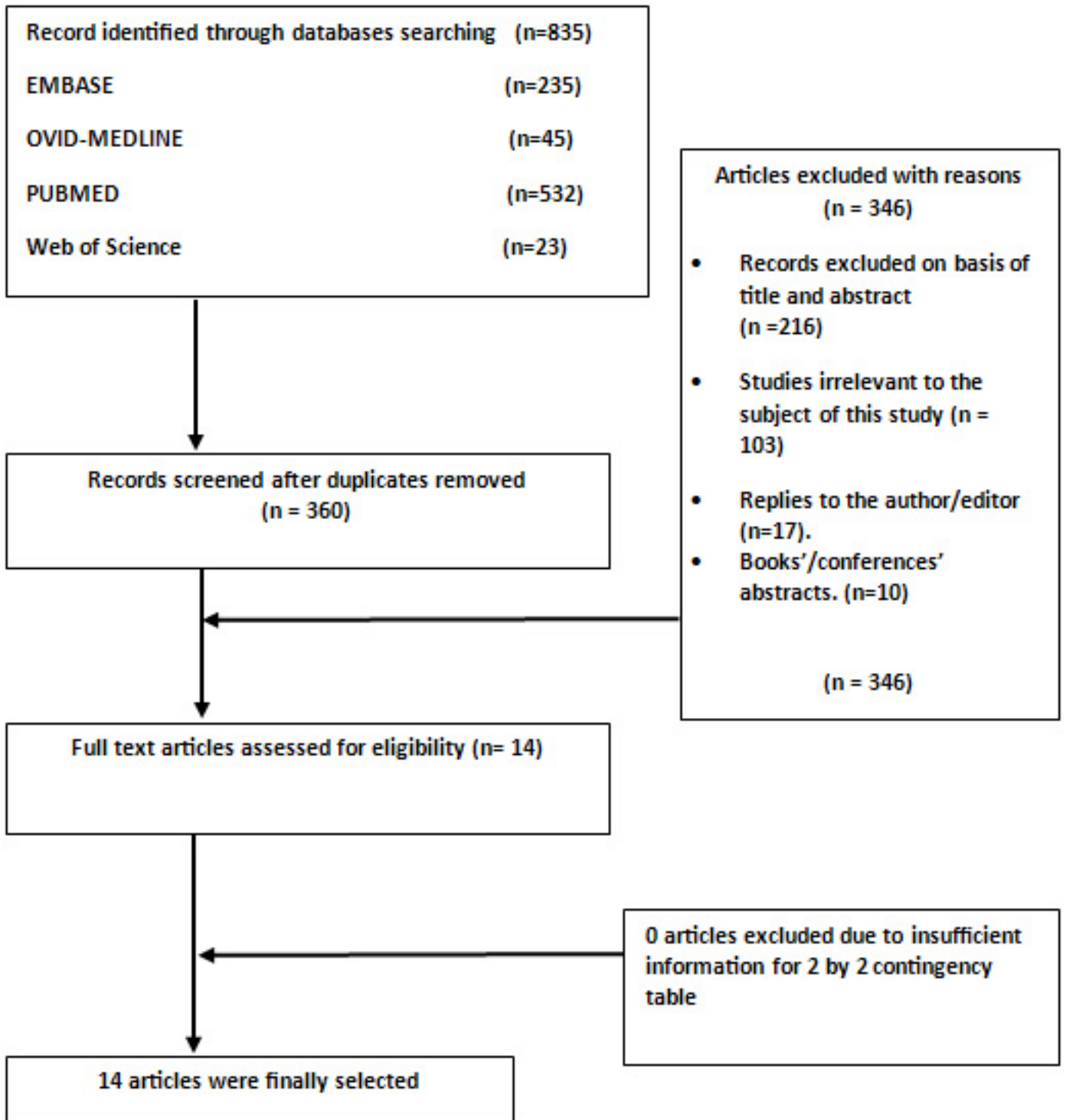
Data was extracted from the included studies using a standardized data extraction form. The extracted information included study characteristics (e.g., author, year of publication, study design), participant characteristics (e.g., sample size, demographic information), intervention details (e.g., type of intervention, duration, components), outcome measures (e.g., adherence rates, patient perceptions), and key findings. Data extraction was performed independently by two reviewers, with any discrepancies resolved through discussion or consultation with a third reviewer, if necessary.

Results

The electronic search strategy conducted in this review ended in 835 hits which after removing duplications reduced to 360 studies. These 360 studies were considered eligible for further evaluation, from which 346 studies were excluded for different reasons as 216 studies were based on title and abstract, and 103 studies were not relevant to the subject of this study or sitting of this review, 17 were considered replies of authors, and there were 10 books. Finally, 14 articles were included in the qualitative synthesis of the present review (Figure 1).

The systematic review included a total of 14 studies that aimed to improve medication adherence in various populations and settings. The studies were conducted in different countries, including the USA, Canada, Turkey, China, Iran, the UK, and the Netherlands. The publication of the studies was during the last 20 years, ranging from 2003 to 2023. The study designs varied among the included studies, with randomized controlled trials being the most common design. Other designs included randomized clinical trials and parallel-group randomized controlled trials. The duration of follow-up ranged from 2 months to 12 months, with most studies having follow-up periods between 6 weeks and 6 months. The primary aim of the included studies was to evaluate the effectiveness of interventions in improving medication adherence or related outcomes. These interventions employed diverse approaches, such as behavioral interventions, patient-oriented education, in-home monitoring, supportive nursing interventions, motivational interviewing, nurse-led case management programs, self-management programs, pharmacist-led interventions, and technology-based interventions (telephone calls, text messages). The outcomes assessed in the studies included blood pressure control, medication adherence rates, self-efficacy, hospitalization rates, symptom improvement, and the impact on chronic conditions such as hypertension, diabetes mellitus, and schizophrenia.

Figure 1: The PRISMA figures showing the steps to choose the studies for systematic review



Interventions involving tailored phone calls or educational materials did not yield significant improvements in medication adherence. Friedberg et al. [12] conducted a study with 533 adults with hypertension, providing tailored monthly phone calls, but found no significant improvement compared to usual care. Similarly, Hamet et al. [13] provided educational material via mail to 4,864 adults with essential hypertension, but no significant improvement in medication adherence was observed.

In contrast, interventions that involved face-to-face counseling sessions or self-management programs showed promise in improving medication adherence. Ma et al. [16] conducted a study with 120 adults in community health centers, offering counseling sessions, and demonstrated a significant improvement in adherence. Hacıhasanoğlu et al. [14] implemented a comprehensive intervention with clinic and home visits, medication adherence education, and follow-up phone call interviews for 120 adults with hypertension, resulting in a significant improvement in medication adherence compared to baseline.

Nurse-led interventions, including supportive nursing care and nurse-led adherence support, did not show significant improvements in medication adherence. Kauric-Klein et al. [15] provided supportive nursing care to 118 adults receiving hemodialysis but did not find a significant improvement. Similarly, Schroeder et al. [20] conducted a study with 245 adults in general practices, offering nurse-led adherence support, but no significant improvement was observed.

Pharmacist-led interventions, such as patient-tailored consultations, did not yield significant improvements in medication adherence. van der Laan et al. [21] conducted a study with 170 adults in a community pharmacy, providing two consultation sessions with a pharmacist, but no significant improvement in adherence was found.

Interventions involving stroke physician specialist assessments, behavioral feedback, medication reviews, and motivational interviewing also did not demonstrate significant improvements in medication adherence. Mackenzie et al. [17] conducted a study with 56 adults in stroke prevention clinics, offering stroke physician specialist assessments and follow-up phone calls, but no significant improvement was observed. Ruppert et al. [19] provided behavioral feedback, counseling, and education to 33 adults in senior centers, but no significant improvement in adherence was found. Williams et al. [22] conducted a study with 80 adults in outpatient clinics, providing medication reviews and a DVD video, but no significant improvement in adherence was observed. Emile Barkhof et al. [23] and Beebe et al. [24] implemented motivational interviewing, telephone calls, and text messages in separate studies with adults in psychiatric clinics, but no significant improvements in medication adherence were reported.

Finally, a systematic review by Farmer et al. [25] examined various interventions, including in-person and telephone sessions, real-time medication monitoring dispensers, and web-based programs, involving 4,820 adults from different healthcare settings. The pooled analysis showed a moderate but not statistically significant difference in medication adherence between the intervention and control groups.

Table 1: General characteristics of the included studies

No.	Authors	Year of publication	Country	Design	Follow-up	Aim	Critical Appraisal
1	Friedberg [12]	2015	USA	Randomized Controlled Trial	6 months	Evaluation of the effectiveness of 2 behavioral interventions to improve BP control	The study was conducted among specific population (Urban Old veterans with hypertension)
2	Hamet [13]	2003	Canada	Randomized clinical trail	12 months	To improve medication adherence in patients with essential hypertension by modifying their behaviors	Moderate risk for selection bias in the nature of enrolment
3	Hacihasanoglu [14]	2011	Turkey	Randomised controlled study	6 months	Determine the effect of anti-hypertensive patient-oriented education and in-home monitoring for medication adherence and management of hypertension	No risk for bias
4	Kauric-Klein [15]	2011	USA	Randomised controlled study	12 weeks	examined whether a supportive nursing intervention incorporating monitoring, goal setting, and reinforcement can improve blood pressure (BP) control in a chronic HD population	The study depended on small sample size
5	Ma [16]	2014	China	Randomised controlled study	24 weeks	This study tests the effectiveness of motivational interviewing compared with the usual care for Chinese hypertensive patients.	The study depended on small sample size
6	Mackenzie [17]	2013	Canada	Randomized controlled study	6 months	Evaluated whether a model of nurse-led case management program would improve BP measures and adherence to medications.	The study depended on small sample size
7	Moradi [18]	2019	Iran	Randomized controlled trial	12 weeks	Evaluate the effects of a self-management program based on the 5 A's model on self-efficacy among the older men with hypertension.	The study depended on small sample size
8	Ruppar [19]	2010	USA	Randomized controlled study	20 weeks	Test of a novel 8-week behavioral feedback intervention to improve antihypertensive medication adherence (MA) and BP control among older adults	The study depended on small sample size
9	Schroeder [20]	2005	UK	Randomized controlled	2	To evaluate the effect of nurse-led adherence support for people with uncontrolled high	Low risk of bias

					study	months	blood pressure compared with usual care.
10	van der Laan [24]	2018	Netherlands	Parallel-group randomized controlled trial	3 months	investigate the effectiveness of a patient-tailored, pharmacist-led and theory-driven intervention program aimed to enhance self-reported adherence to antihypertensive medication	Moderate bias of selection of patients
11	Williams [22]	2012	Australia	Randomized controlled trial.	12 weeks	Test the feasibility and impact of an intervention consisting of self-monitored blood pressure, medicine review, a Digital Versatile Disc, and motivational interviewing telephone calls to help people with diabetes and kidney disease improve their blood pressure control and adherence to prescribed medications.	Small sample size.
12	Emile Barkhof [23]	2013	Netherlands	Randomized controlled study	6 and 12 months	Determine the effectiveness of a MI intervention on adherence and hospitalization rates in patients, with multi-episode schizophrenia or schizoaffective disorder	Subgroups were relatively small and patients were not randomized on these characteristics.
13	Beebe [24]	2014	USA	Randomized controlled study	9 months	The study compared the effect of telephone calls only, text messages only, and both telephone calls and text messages on individuals' symptoms and medication adherence.	Small sample size
14	Farmer [22]	2016	UK	Systematic review	6-12 months	To assess the impact of interventions promoting the monitoring of medication use and brief messaging to support medication adherence in patients with Type 2 diabetes mellitus.	There is risk of bias in the findings of the majority of trials included in this systematic review

Table 2: The summary of the intervention used in the studies and its outcomes

First author [Ref]	Subjects/setting	Intervention/s modality and strategy	Control care	Interventionist profession	Measured constructs	Method of measuring adherence	Improvement in medication adherence
Friedberg [12]	533 adults in Veterans Affairs medical center clinics with hypertension	Patients received tailored monthly phone call	UC	Psychology counselors or social work		MMAS	Not sig. improvement ($p = .306$)
Hamet [13]	4,864 adults with essential hypertension from general practice setting	Patients received educational material at 1, 2, 3, 4, 6, and 12 months via mail	UC	Nurses		Discontinuation rate	Not sig. improvement ($p = .94$)
Hacihasanoglu [14]	120 adults in public primary health care facilities and homes with hypertension	A: four clinic visits, two home visits and medication adherence education, follow-up phone call interviews B: four clinic visits, two home visits and healthy lifestyle education, follow-up phone call interviews	UC	Nurses		MAES	Sig. improvement (A&B: $p < .0001$) compared to baseline
Kauric-Klein [15]	118 adults in hemodialysis center with hypertension	Two education sessions, weekly individual meeting	UC	Nurses	Self-efficacy	MMAS	Not sig. improvement ($p = .30$)
Ma [16]	120 adults in community health centers with hypertension	Counseling session/face to face	UC	Nurses	Self-efficacy	TAQPH	Sig. improvement ($p = .039$)
Mackenzie [17]	56 adults in stroke prevention clinics	Stroke physician specialist assessment, monthly follow-up phone call	UC	Physicians and Nurses	Self-efficacy	Self-report of number of missed pills, review of prescription renewal patterns	Not sig. improvement ($p = .2$)
Moradi [18]	60 adults outpatient clinic with hypertension	Face-to-face meeting every 12 weeks, 1 hr training session with family members, daily phone call for the first 2 weeks and, then, weekly	UC	Nurses		Steinberg's Hypertension Self-Efficacy Scale	Not sig. improvement ($p = .07$)

Ruppar [19]	33 adults in senior centers with hypertension	Biweekly feedback, habit counseling, medication and disease education, a medication instruction card	UC	Nurse		Electronic medication bottle cap with a digital display	Not sig. improvement ($p = .2$)
Schroeder [20]	245 adults, general practices with hypertension	One adherence support face-to-face session and one reinforcement session	UC	Nurse		MEMS cap	Not sig. improvement ($p = .76$)
van der Laan [21]	170 adults in community pharmacy with hypertension	Two consultation sessions face to face	UC	Pharmacists	Belief, Illness Perception	Horne's MARS-5	Not sig. improvement ($p = .18$)
Williams [22]	80 adults, outpatients' clinics with hypertension	Medication review, 20 min DVD video via telephone	UC	Nurses		MMAS	Not sig. improvement ($p = .16$)
Emile Barkhof [23]	114 adults in psychiatric clinic	Motivational interviewing ($n = 55$)	UC (Health education)	Nurses		Medication Adherence Questionnaire for Schizophrenia or Bipolar Disorders	No significant differences between motivational interviewing and health education on 6- and 12-month follow-up ($p = 0.34$).
Beebe [24]	30 adults in psychiatric clinic	Telephone call ($n = 10$) SMS ($n = 10$) Telephone + SMS ($n = 10$)		Nurses		Pill counts for Schizophrenia or Bipolar Disorders	No significant difference in adherence was noted between the groups on the basis of pill counts ($p = 0.31$).
Farmer [25]	4820 adults who presented at pharmacies, primary care.	Patients had in-person and telephone sessions, Real-time medication monitoring dispenser, web-based programme in which participants	UC	Nurses, pharmacist		MMAS, Questionnaire, Medication Event Monitoring System, self-report	The pooled difference in medication adherence between intervention and control was moderate and not statistically significant [standardized mean difference = 0.22 (95% CI -0.05; 0.49)].

Discussion

Adherence to medication regimens is crucial to the successful management of a variety of medical illnesses [26–28]. Many patients, however, struggle to adhere to their recommended pharmaceutical regimens, resulting in unsatisfactory treatment outcomes [29,30]. This systematic study sought to assess the efficacy of several approaches for enhancing medication adherence. The included studies employed a variety of strategies, and their results were highly variable.

Several approaches, including individualized phone calls and educational materials, did not significantly increase medication adherence. Friedberg et al. [12] and Hamet et al. [13] both implemented programs aimed at individuals with hypertension; however, neither intervention demonstrated a substantial improvement in adherence. These findings are consistent with several studies including two systematic reviews which showed that the use of electronic communication and technology showed limited evidence to be effective in increasing the adherence rate to medications [31,32]. These findings suggest that providing targeted information or reminders may not be adequate to address the complex causes behind non-adherence to medicine.

Conversely, therapies incorporating in-person counseling sessions or self-management programs demonstrated more promising outcomes. Ma et al. [16] developed counseling sessions for adults at community health clinics, resulting in a significant improvement in medication adherence in comparison to standard care. Similarly, Hacıhasanolu et al. [14] performed a comprehensive intervention consisting of clinic and home visits, education, and follow-up interviews, which resulted in a substantial improvement in adherence among individuals with hypertension. In a previous systematic review, the authors found that 6 out of 17 studies that used telemedicine showed a significant improvement in the medication adherence and all interventions which had a statistically significant positive effect on medication adherence involved personal contacts between therapists and patients [33]. Moreover, multiple studies have demonstrated that provider-guided therapies are more successful than self-guided ones [34–39]. Additionally, provider-led interventions are more durable [35]. There appears to be no difference in effectiveness between interventions led by nurses and those led by pharmacists [38]. Additionally, several studies on the efficacy of eHealth interventions have indicated that personal contact with a healthcare professional or non-professional can promote drug adherence [40,41]. Patients are afraid, for instance, that without personal interaction, advice may be provided incorrectly or that they may lose motivation for the intervention [42]. Choi demonstrated that informal social support and eHealth can promote healthy behaviors in tandem [43]. Additionally, virtual group therapy appears to have similar outcomes as in-person group therapy [44–46]. These results demonstrate the significance of tailored support and education in encouraging drug adherence. Medication adherence was not significantly improved

by interventions led by nurses, including supportive nursing care and nurse-led adherence support. Adults on hemodialysis were provided nursing care by Kauric-Klein et al. [15], although adherence did not improve appreciably. Similarly, Schroeder et al. [20] conducted a trial in general practices in which nurse-led adherence support was provided, but no substantial improvement was reported. These findings imply that although nurses play a vital role in patient care, other methods may be required to effectively manage pharmaceutical non-adherence.

Medication adherence was not significantly improved by interventions comprising stroke physician specialized assessments, behavioral feedback, medication reviews, and motivational interviewing. Mackenzie et al. [17] used stroke physician specialized exams and follow-up phone calls for people in clinics for stroke prevention without seeing a substantial improvement. Adults at senior centers received behavioral feedback, counseling, and education from Ruppert et al. [19], but there was no substantial increase in adherence. Williams et al. [22] conducted medication reviews and distributed DVD videos to adults in outpatient clinics, but there was no substantial improvement in adherence. In separate investigations with adults in psychiatric clinics, Emile Barkhof et al. [23] and Beebe et al. [24] employed motivational interviewing, telephone calls, and text messages, but no substantial increases in medication adherence were reported. These findings imply that these interventions may not be sufficient on their own and may need to be incorporated into more extensive adherence support programs [47,48].

A systematic review by Farmer et al. [25] investigated a variety of interventions, such as in-person and telephone sessions, real-time medication monitoring dispensers, and web-based programs, in various healthcare settings. The pooled analysis revealed a considerable but not statistically significant difference between the intervention and control groups in terms of medication adherence. In spite of the fact that these interventions may have some good influence on adherence, their overall effectiveness remains unclear, and additional research is required.

Variability in the efficacy of therapies to enhance medication adherence demonstrates the complexity of non-adherence and the need for individualized approaches. Importantly, medication non-adherence is influenced by a variety of factors, including patient views and attitudes, socioeconomic factors, healthcare system limitations, and drug-related problems [49,50]. Comprehensively addressing these variables may necessitate interventions that integrate educational, psychological, and behavioral measures.

Future research should focus on the development and evaluation of therapies that address the unique requirements and problems of various patient populations and healthcare settings. Adapting interventions to specific patient characteristics, such as socioeconomic position, health literacy, and cultural background, may be essential for increasing drug adherence. In addition, interventions

In addition, interventions involving teamwork across healthcare practitioners, such as pharmacists, nurses, and physicians, may have a higher likelihood of success.

In conclusion, improving drug adherence continues to be a key concern in healthcare. Some therapies, such as face-to-face counseling and self-management programs, have shown promise in enhancing adherence, but others, such as personalized phone calls and educational materials, have generated limited or no meaningful gains. Several factors appear to influence the efficacy of interventions, including the individual patient group, the intervention's complexity, and the healthcare system. To discover the most effective techniques for promoting drug adherence and to design therapies that address the varied character of non-adherence, additional research is required. Healthcare professionals can improve patient outcomes and optimize the management of chronic illnesses by employing individualized and comprehensive strategies.

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